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MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

APRIL, 1829.

Observations on the connexion of Mechanical Skill, with the highest attainments in Science; being the substance of a lecture introductory to a course of Mechanics; delivered to the Franklin Institute, by the Editor, *January 24th*, 1826.

(Continued from page 159.)

The manufacture of pottery had remained, in England, in a comparatively rude state, until Josias Wedgwood, about 60 years ago, effected in it a complete revolution. The porcelain used by the opulent, was imported from France, to the great disadvantage of the English manufacturer. Wedgwood was the son of a potter in Staffordshire, and from early youth was employed in his father's business. His education was very limited, and his patrimony small; but his mind was vigorous, and he soon manifested its superiority by the improvements which he introduced.

By him was invented the Wedgwood, or queensware, which soon not only excluded the foreign manufacture from the market, but also supplied a large quantity for exportation, and gave a new spur to trade, extending the business far beyond all former example. He made himself acquainted with chemistry, instituted a vast number of experiments, and discovered various materials applicable to his business, forming many new species of earthenware and porcelain, both useful and ornamental. As he acquired wealth, he liberally expended it for the promotion of the arts, particularly in their application to his own business. The figures on his cameos and intaglios, rivalled the productions of ancient Greece. The Portland vase, found in the tomb of the emperor Severus, he imitated with perfect

success; in form, in colour, and in the grace and beauty of the figures with which it was enriched.

By his means, the district which he inhabited, became the centre of a vast population, and a place of great wealth. He lived highly esteemed for his moral and intellectual qualities, the associate of men distinguished for genius and science, and died, universally regretted, in the year 1795.

Sir Richard Arkwright, the youngest of thirteen children, whose parents were in indigent circumstances, was originally a country barber; but although he enjoyed neither the advantages of fortune, or of education, nature had endowed him with a fine mechanical genius, and an untiring ardour in the pursuit of his object; these qualities enabled him to rise above the numerous obstacles resulting from obscurity, from poverty, and from prejudice; procuring for him both rank and title, and enabling him to accumulate a princely fortune. His first recorded mechanical effort, was in the pursuit of the phantom, perpetual motion; a phantom which has misled a great number of men possessing more mechanical genius than scientific information, and has sometimes beguiled those who had some claims to learning. Arkwright was induced to abandon his chimera, and he then turned his attention to the improvement of the machinery for the spinning of cotton. At this period, cotton was scarcely known in Great Britain as an article of commerce, whilst at the present day it is, in a commercial and manufacturing point of view, the most important; employing a large portion of her population in the various processes connected with it, and increasing the national wealth, in an unexampled degree.

An individual, obscure, and apparently powerless, was destined, by his mechanical skill, to produce this mighty revolution; the business which he created, caused towns to be founded, where, otherwise, hamlets could scarcely have existed; and has given to the cultivator of the soil in our own, and many other countries, a most important article of produce, exhausting it but little, remunerating the labourer for his toil, and furnishing to every civilized country, innumerable articles of comfort and convenience. Before dismissing this eminent individual, we will remark, that the essential improvements made by him, remain with little or no alteration at the present day; these are, the ingenious mode of drawing out the cotton by means of rollers, and the beautiful process of delivering it from the cards, in a continued fleece. The mechanical genius of Arkwright, was not his only excellence, for after having carried his inventions into complete effect, he introduced into the manufactories in which he was concerned, a degree of order, cleanliness, and industry, altogether unexampled in any similar establishment.

After speaking of the improvements made by Arkwright, in the manufacturing of cotton, we are led, by a natural association, to the steam engine, as it came out of the hands of that scientific mechanic, Watt. At the time when Arkwright was bringing his machinery to perfection, Watt was a mathematical instrument maker in Glasgow. Having attended the lectures of Dr. Black, who was then professor

of chemistry in that place, he had become acquainted with the doctrine of latent heat, as discovered and taught by that eminent individual. A working model of the atmospheric steam engine, was placed for repair, in the hands of Watt; and he was led to remark the great waste of heat, in the condensation of the steam; a waste, the amount of which could be estimated, only, by one possessed of the scientific knowledge which he had derived from Dr. Black. To obviate this, required that singular skill which he displayed in the improvements which he introduced; promoting economy in fuel, acquiring a vast accession of power, and rendering the motions of the machine so equable and manageable, as to adapt it perfectly to the purposes of the manufacturer; thus giving him a first mover, which he could use wherever a small quantity of water and the requisite fuel could be obtained. The steam engine, therefore, contributed in an eminent degree, to the success of the cotton manufacture, as well as to that of many others.

At some other time we shall have occasion to exhibit to you, various proofs of the eminent skill of this philosophical mechanic, who, whilst he acquired the wealth which he so well deserved, gave to his country and to the world, an instrument more powerful in its operation, and more general in its application, than any previously known. At the Chatwater mine in Cornwall, there is a steam engine erected, of 1010 horse power, and, of course, performing the labour which would require the employment of 3030 horses, supposing a horse to perform 8 hours constant labour, in every twenty-four. By this engine, a mine of 600 fathoms deep is kept dry. In numerous instances, mines which had been abandoned, in consequence of the impossibility, or the expense, of keeping them free from water, are worked with facility and profit; and the engine is applied to a variety of purposes, too numerous to detail. In the structure of the steam engine, in its present improved state, we see the application of the principle of mechanical philosophy in a number of beautiful and ingenious contrivances, which give to its motions the appearance of intellectual impulse; whilst a knowledge of the most recondite principles of chemical philosophy, is displayed in the formation and arrangement of its several parts; exemplifying in a manner the most striking, that "knowledge is power," and proving the correctness of the observation, that this machine is "a present from philosophy to the arts."

At a very early period, attempts were made to apply the steam engine to the purposes of navigation; and a patent was taken out in England as early as the year 1736. Some writers of that country have mentioned this circumstance, as a proof that the invention originated in England; and upon this subject a degree of pertinacious illiberality has been evinced, little becoming a high minded people, who have so much of which they may justly boast, without preferring claims that are false, or equivocal. Who is it that really has a claim to the character of an inventor? Is it the man who *thinks* that a certain thing may be done, yet never attempts to accomplish it? Is it he who points out to others the means by which *he* feels

assured the end may be attained, and allows his efforts there to end? or is it the man, who, confident of success, carries his projects into execution, and finds his labour end in abortion? If these be inventors, what are the benefits which society derives from their waking dreams, or their works, which only serve to demonstrate what they cannot do? Yet when some superior genius appears, when a Fulton applies the powers of a mind richly endowed with science, practically skilled in mechanics, and corrected by patient inquiry and observation, and by using the hand of the master, at once accomplishes his purpose, a host of competitors crowd around him, and numbers are even raised from the dead, to dispute the validity of his title. Such was the case when the first steam boat triumphantly stemmed the tide of the Hudson; demonstrating even in this first attempt, the mighty revolution which this means of conveyance was destined to accomplish. Incalculable are the advantages to commercial intercourse, which have resulted from the use of steam boats; not upon our tide waters only, but also upon those magnificent rivers which traverse our country, whose waters roll towards the ocean with a rapidity which rendered their ascent nearly impossible, a task which is now accomplished in less time than that formerly required to descend with the current. Great, however, as are these immediate benefits, and vast as they are, prospectively considered, they, in conjunction with those internal improvements which have been effected, or are in progress, are likely to give a stability to our happy form of government, by increasing and strengthening the ties by which these states are bound together; a good which in itself transcends every other. Although we may lament that justice is frequently tardy in her progress, and regret that an individual who has done so much for his country and for the world, should have himself enjoyed so little of the fruits of his labours, we may yet assure ourselves that posterity will not allow others to divide with him the fame to which he is so justly entitled, and that it will be acknowledged that the whole glory of success was, in this instance, due to American genius.

We may here notice how extensive is the influence of a single discovery, or improvement, in the promotion of objects with which, at first view, it appears to be not at all, or but remotely connected. It is probable, that when Watt made his first great improvements in the steam engine, his views were confined to the rendering it more efficient and economical in its application to the purposes to which it had been principally applied; namely, to the raising of water from mines, or from other situations where this operation was required; and most assuredly, he had no conception of the various uses to which it was destined, even during the period of his own life. He had, however, the satisfaction of seeing his country enriched by the use of the powerful instrument of which he was the parent, from its adoption in almost every manufactory in which great strength, or force, is required; of viewing it substituted for horses in the conveyance of heavy loads, and of overcoming the obstructions from wind and tide, in the navigation of vessels. We have adverted to the facility which it gave in extending the manufacture of cotton;

and of course it thus created a great demand for the raw material, and gave birth to its extensive culture; a benefit in which the United States have largely participated. It would be foreign to the design of this lecture to trace the progress of this staple of our country; but we notice it for the purpose of exhibiting another triumph of mechanical genius, in overcoming the greatest difficulty encountered by the planter in bringing it into the market, at a price which he could command, and which would reward him for his labour. It was necessary to separate the cotton from the seed, of which it forms the envelope; to accomplish this by hand, or by the other tardy methods which had been attempted, was impossible. The roller gin could not be used with the upland cotton, which is the principal product of the country. When picked by hand, 4 pounds were a full day's work, whilst with a gin of 40 jaws, which may be worked by one horse, 2000 lbs. may be cleared from the seed in a day, and the labour performed, is nearly a thousand fold. The numerous cotton gins which are to be seen in every state south of the Potomac, attest the skill of Whitney of Connecticut. This machine, it is said, was first made when Whitney had not visited the south, and had never seen a cotton field.

At a period when the resources of our country offered but few facilities to the votary of science, and when the powerful stimulus afforded by scientific associates, was enjoyed in a very limited degree, the neighbourhood of Philadelphia produced a Rittenhouse. "We have," says Mr. Jefferson, in his Notes on Virginia, "supposed Rittenhouse second to no astronomer living: that in genius he must be first, because he is self-taught. As an artist, he has exhibited as great proofs of mechanical genius as the world has ever produced. He has not indeed made a world; but by imitation, he has approached nearer its maker, than any other man who has lived, from the creation, to this day." David Rittenhouse was born near Germantown; his father was a tanner, and had intended his son for the same pursuit. At the early age of seven years, he manifested his genius for mechanics, by constructing a small model of a water-mill; and he continued through a series of years, to exhibit the superiority of his mind, by his progress in the mathematics, with which he appeared to become acquainted almost intuitively; he also made, first a wooden, and afterwards a brass clock, employing the little leisure which his agricultural labours allowed, in scientific study, and mechanical pursuits. At school, his advantages were of the most ordinary kind. From his father he received no encouragement in the path to which his genius pointed, until he was 19 years of age, when he was prevailed upon to supply him with money for the purchase of a few tools, to enable him to manufacture clocks; whilst such as his funds did not allow him to buy, were produced by his own labour. He continued for many years to make clocks, all of them remarkable for the superiority of their workmanship; and some, for astronomical purposes, were unrivalled in excellence. He also made mathematical and philosophical instruments of various kinds, and of peculiar accuracy, whilst he ardently studied and mastered,

those sciences with which they were connected in their use; and was as skilful in their application, as he was in their construction. His country duly appreciated him, and whenever great accuracy was required, either in celestial observations, or in settling the frequently contested question of the boundary line between states, his services were sought, and that confidence was accorded to his talents as a philosopher, and his worth as a man, which rarely, if ever, allowed an appeal, when his opinions were fully made known.

During, and subsequent to, the revolutionary war, he was frequently called into public employments; he was a member of the continental congress, in the year 1775; of the convention which formed the first constitution of this state, and was unanimously appointed state treasurer. He was the first director of the United States mint, and for several years president of the philosophical society. Soon after the peace of 1783, he was elected a fellow of the Royal Society of Great Britain, a compliment the more valuable, as during the whole of the contest for independence, he had been a steady patriot.

Our time will not allow us to add to our list, many who have strong and just claims to our attention; but there yet remains one whose name must not be omitted, associated as it is in the hearts of all who are now present, with every thing that is good and great in the human character; one who illustrated by his example, the excellence of his maxims, who illuminated the world by his philosophy, and who powerfully aided, by his patriotic efforts, in rescuing his country from the grasp of the oppressor. Need I pronounce the name? Franklin dwells on every tongue; need I advert to the incidents of his life? they are familiar even to the most juvenile part of my auditory. You need not be told that he was a mechanic, compelled when only ten years of age, to labour for subsistence; that in literature he was his own instructer, overcoming by persevering industry and consummate prudence, the obstacles which impeded his career; and thus manifesting what may be accomplished by a vigorous intellect, steadily employed in the pursuit of knowledge, although unaided by the advantages of early culture, in the school of science. I need not tell you how his fame is recorded in the books of philosophy, and in the annals of his country. I need not mention to you the numerous institutions, for the increase of knowledge, and the purposes of benevolence, of which he was the founder; which are the boast and ornament of our city, and which have been admired and adopted by others. This Institute, intended to diffuse the light of science, among a numerous and most important portion of the community, has appropriately derived its name from one whose example is so powerfully calculated to secure the objects of its formation.

I have attempted to place before you a few instances of the power of mechanical genius, when judiciously applied, to elevate the character of the possessor, in a pre-eminent degree; raising the artisan to distinction and opulence, or enabling the philosopher to pursue, with success, his attempts to enlarge the boundaries of human knowledge. We might have swelled our catalogue, would our time have admitted, or had our purpose required it. France, Germany, Italy,

and other European states, would have afforded many illustrious examples; but we have confined ourselves to England and to our own country, as they offer instances more familiar and more numerous. In countries where the iron grasp of despotism is constantly felt, and the great mass of the people is trampled under the feet of a domineering aristocracy, fortunate indeed must he be, whose efforts enable him to surmount the accumulated obstacles which oppose his rise, and confine him to his caste. Happily, we live under institutions which admit of no degrading distinctions, and in a country where the general feeling is outraged by any attempt to render a useful pursuit odious; where the human mind is free to exert its native energies, and to claim and attain the station due to its genius and its merits. Here science freely proffers her aid to the mechanic, and asks his services in return. How eagerly would most of those great men, whose names I have mentioned to-night, have seized upon opportunities, such as are now presented to the rising mechanics of Philadelphia; how would they have been aided in their progress, and have been relieved from days of toil and nights of vigilance, in attempting to attain a knowledge of the first principles of science. May we not hope, or rather, may we not feel assured, that there are now in this hall, some juvenile Franklins, some future Rittenhouses, some incipient Brindleys, who will hereafter amply pay the debt which they will owe to this institution, and, in a manner the most grateful, reward its founders, by manifesting its utility.

The field of science is not contracted by the exertions which have been made to explore it; but like the actual boundaries of our country, is enlarged by the increase of occupants and of culture; nor is there any ocean to limit our eventual progress. As an individual, I can most truly assure those whose benefit it is intended particularly to promote, that I shall never be found deficient, either in zeal, or industry, in the performance of the duties which devolve upon me; and that I count largely upon the assistance which I shall receive from the intelligent mechanic, whose practical observations, I have no doubt, will frequently stamp a value upon my labours, which they otherwise could not possess.

On the Baltimore Rail-road Carriage, invented by Ross Winans, Esq. *and the manner of adapting it to streets; also on cheap Rail-roads. By* J. L. Sullivan, Civil Engineer.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—The principle of the carriage invented by Mr. Winans, has been already mentioned by you in the January number of the Journal of the Institute, with an intimation of your purpose of giving the whole specification at a future time.

In the same number of the Journal, there is also a description of Mr. Howard's rail-way carriage, with a jointed perch, and with friction wheels on the principle of Mr. Winans' *first modification*. It

is not supposed that Mr. Howard was aware of the previous claim of Mr. Winans, and I have understood from you, sir, that Mr. Howard rested his claim principally upon the jointed perch, as a means of turning upon curved rails. Be this as it may, I deem your notice and Mr. Howard's specification, to be sufficiently descriptive of the first mode, and shall, therefore, limit this explanation to the *second*, with respect to the originality of which there can be no question. And this modification derives a strong claim to notice, from the circumstance of its having been preferred by the board of engineers of the Baltimore rail-road.* Perhaps as this communication will occupy several pages of your useful Journal, it will obviate the necessity of your inserting Mr. Winans' specification, which is of considerable length, especially as copies may be had on application.

I do not encumber your work with a discussion of the subject of the right to the first modification, further than to refer to your volume of the last year, in which is found an able exposition of the patent law, wherein decisions under it are cited, which settle among original inventors, the privilege in favour of him who is earliest in practice.

The reasons of the preference given to the second modification by the Baltimore company, were, its simplicity and freedom from fixtures. Besides it is easily converted to use, temporarily, on streets. This improvement in the carriage, consequently obviates some of the greatest inconveniences of the ordinary rail-road carriage, its not delivering loading at its special destination, the delay at its termination, and the expense of drayage.

With the more pleasure, therefore, I avail myself of an invitation of the committee of the Institute, to enter somewhat at large into the whole subject, under the impression that an account of the useful effect of this invention will be the more acceptable, as it, perhaps, is destined to become the instrument of that celerity and economy, in transportation between the eastern end of the Pennsylvania canal and Philadelphia, on which the expected concentration of commerce here, so much depends.

The public works of our country have received their impulse, and public opinion is daily attaching to them an increased value. The form first given to them, had direct relation to the more immediate and most important object, the domestic trade of the states to which they belong. But there is also another valuable object, not always sufficiently distinguished, profit from transport. The agriculture of our extensive vallies, and the minerals abounding in their mountainous borders, demanded canals; and favourable ground, with abundance of water, recommended them. But revenue from *transit commerce*, originating beyond the borders of the state—most active when the western waters are favourable to conveyance far into the country—the elevation of the intervening ground, and our climate, seem to prescribe rail-road communications.

The reasons which induced the intelligent citizens of Baltimore not to rest contented with the Potomac and Ohio *canal*, but to under-

* It is also adopted on the Liverpool and Manchester rail-road.

take a rail-road of unexampled extent and boldness of design, in order that merchandise from that city might reach the Ohio seasonably, are obvious; and if general considerations were sufficient to justify that resolution *before* the compound carriage was known, how much more confidence may be now entertained, since by this invention the Alleghany mountains will be traversed with as much useful effect as the plains of England have heretofore been; and steam power add unexampled expedition to unprecedented economy.

While, therefore, the products of Virginia and Maryland from along the tributaries of the Potomac, must give ample occupation to that canal, as those of New York do to Erie, and as Pennsylvania must to those formed by this state, it will be found that more must be done; that the system of communications will be incomplete, until Philadelphia draws her supplies of merchandise from New York by the facility of a rail-road; and the interior of the state shall reach the wheat market in winter by a continued rail-road, the whole distance from Carlisle. It is alone by economy of access to market, that the flour of Philadelphia can be afforded as low as will be that of Baltimore. And New Jersey will make her canal, but will not neglect a valuable source of revenue more sure from a rail-road for winter travel.

The opinion appears to be established, that our country requires a different kind of rail-road from that employed in England. The comparative density of population, the immensity of her trade, and the moderate extent of her territory, are all contrasted with our widely extended states and sparse population; but, while the greatness of our agricultural produce supplies the deficiency in the comparison as to quantity, there remains with us the present disadvantage of great distances, the uncommon length of our public works of this kind. Less expensive modes of construction, in order that the investment may not be a loss of value in first hands, seems indispensable.

Various forms of rail-way have been suggested; and some of them sacrifice durability too much to cheapness. I aim, therefore, to show how there may be savings enough in capital to allow, besides ample dividends, a reservation from revenue to form a renovating fund. If this fund is allowed to accumulate, at compound interest, rail-roads of a kind suitable to our climate, may be among the best property; because not liable to be rivalled, like turnpikes, by free roads. Railways cost too much ever to be free, besides that they must have an appropriate carriage, owned by the proprietors of the road, that the public may have full accommodation. The public has the same interest with the owners in there being an ample number of wagons.

Perhaps it will be found that a road of the following description, will combine economy with long duration—it will not be elegant, but substantial.

No rail-road can be of long service that is not substantially and accurately made. We may use cheap materials, but the foundations and workmanship must be perfect. In England, they employ much broken stone, for reasons not so applicable to our plan as to theirs.

It serves to keep their blocks in place, and to fill the trenches on which they rest. But great care is taken to form under drains, and take other precautions to preserve the earth dry, and consequently hard. We should here have to go to more expense for the same object, if done effectually. They have to guard against the effects of one foot of frost, but here we have two or three. *Ice* must not be allowed to form among the foundation. It must, therefore, be kept dry. When our plans and estimates propose an imitation of the English rail-way, why is it that the cost is less, notwithstanding iron and labour are here at double the expense? The ground work is not deemed necessary to be so guarded with precautions. Again, in this there is *danger* of *saving too much.*

Timber is so plenty in some parts of our country, that nothing seems easier than to have a rail-road by laying down cross sleepers, surmounting them with string pieces, and these with iron. But how long will it be before the decay of the surface in contact with the ground, disturbs its level and parallel, and the travel tears it to pieces? Posts set in the earth will be more substantial, and may be guarded at the surface, in the following manner.

It is well known that all posts rot only at, and a little below, the surface of the ground; *where heat and moisture combine.* It has occurred to me, that these two causes of decay may be counteracted by surrounding that part of the post by a *pavement set in water lime, or in Roman cement,* (described in my specification thereof.)

Another mode proposed to save expense, is recommended for the Boston and Providence route. It is that of long stone set edgewise on broken stone, to receive a plate rail. Besides the difficulty of fastening iron to stone, when to be acted on, this plan places the rails too near the surface, and subjects them to be covered with ice. The foundation must be rammed equally solid throughout, or the passing of 4 ton loads will depress the string stone where least sustained. It has more liabilities to derangement, than posts, and cannot afford much saving, if the requisite drainage is properly done.

Perhaps the cheapest plan, consistent with firmness, is the following. Let the object be, to make *as much* of the road permanent as can be done with ordinary expense. Let embankments be made at once solid, by puddling. Where wood is used for posts or piles, let them be protected with the cemented pavement, be set in puddle filled with stones, and their heads protected, or, instead of broken stone and blocks, set rough stone posts three feet in width, one foot out of the ground, their heads hewn smooth and drilled for a treenail, with which to secure the bearing timber at *once together and down.*

If the bearing timbers are of *chesnut,* they will be very durable, if split or sawed from the heart to the circumference, because quarters or eighths of the tree will shrink equally, and not crack. Being lodged on the heads of stone posts, they will not decay where in contact; the scarps, horizontal, should have their surfaces separated by a cement of lime and pitch, a composition used by shipwrights.

The form of the timber allows the heart angle, placed uppermost, to be taken off, and a surface formed of 3 inches in width, for the

reception of the rail. A tree of 2 feet diameter, will afford 8 pieces 9 inches deep, with 9 inches base, and these dimensions, if the posts are even 10 feet apart, will be sufficient to bear loads of 4 tons, and be of sufficient lateral stiffness.

The upper surface of the bearer is liable to be heated by the iron while exposed to the sun, and to shrink and crack. To prevent this, the plate may be put on with screw bolts, reaching through, with washers and nuts below; but to give the rail a firm bearing, and allow the cement of lime placed under the plate to remain, two rows of inch nails, an inch apart every way, may be easily driven evenly with the surface of the wood; and then, if the upper surface of the plate is convex, the wheels will run along the middle, and the pressure be equal. The passing load will not have a tendency to loosen the rail, as when flat. A flat rail cannot be mathematically a true plane.

The modes of crossing roads, rivers, &c. are not essentially changed by this plan.

The carriage requires a rather minute description, to be understood by those to whom it is now, for the first time, presented.

If a rail-way is formed firm, smooth, and level, the resistance to be overcome is only friction at the axles, and gravitation when ascending. The latter being a uniform force, when resisting the ascent of carriages, its ratio according to the height of the plane, is alike applicable to the old and the new wagon. Friction must ever exist, however mitigated by the polish of *surfaces* and the use of oil, in proportion to the weight pressing them together. The experiments of Vince proved it to be a uniformly retarding force; those of Colomb, that velocity increasing in geometrical progression, only increased it in arithmetical progression. And we have, you will know, the experiments of Emerson, to prove the proportion of power to weight, when metals of different kinds move on each other. It seems agreed that iron or brass requires one-fifth.

But when the surfaces in question are those of an axle and the nave of its wheel, the friction is under circumstances to be overcome by the augmented power of the lever, that of the 2nd class, which of course common wheels are well known to be.

The mechanical ingenuity of England, appears to have been directed to the perfection of the rail-road and engines; the carriage had received no further improvement than good workmanship. This had achieved the important advantage of reducing the power, according to general practice, to the $\frac{1}{173}$ the load.

In this stage of the art, Mr. Winans conceived the purpose of combining in one carriage, the 1st, as well as the 2nd class of the lever. The effects of friction rollers and friction wheels in machinery, were, no doubt, familiar to his, as to other minds; but to make a *convenient carriage* by this combination, principally for rail-roads, then beginning to be thought of in our country, was worthy of any mind familiar with mechanical science and practised in ingenuity. It was not till after some time had elapsed, that in 1826 he presented his first model at the patent office, with the inquiry, whether this

combination in a carriage were known there. Learning it was not, he deposited it as evidence of his right, and subsequently made that form of compound carriage, described as follows:—

The wheels of common carriages operate as levers of the 2nd class, because the wheel turns on the axle, but when the axle turns with the wheels, it operates as of the 1st class, or as a windlass.

The main travelling wheels of his carriage, are of the latter kind. The fixed axles pass through the wheels, and extend about nine inches from them; the last three inches thereof being converted into smooth gudgeons. These enter under the upper part of the rims of the *secondary wheels*, (those of the 2nd class of the lever,) which, in this modification, are placed outside the large wheels, but do not touch the ground, and are about half their diameter. They have short axles each, which apply in brasses under the double side pieces of the frame, between which they are lodged. Their rims hanging on the gudgeons, their short axles bear up the load frame, and when the primary wheels roll forward on the rail-road, their axles turn, and the gudgeons roll in, on, and under the smooth surface of the rim of these outside wheels, which of course revolve slowly, and turn perhaps once, while the large wheels and axle turn ten times; the bearing or rubbing axles moving thus very slowly, perhaps no attainable speed of the carriage would cause them to heat.

This form of the carriage thus requires no fixtures; but the essential parts are combined naturally together, and work without any liability to separate. Nor is there any friction but that of the small axles, which it is the object of the leverage to overcome. The friction, nevertheless, must be there, however slow they move. Comparative slowness is *incident* to leverage. The space described by the passing surfaces, may be a good *index* of the power employed in this case; but the experiments of Walker and others, have shown that the ratio of resistance is as the weight, nearly, and not as the velocity. Indeed, it is evident that the motion of one end and the other of a lever, is relative. The gain of power is neither augmented nor diminished, by the quickness of the application.

Thus the compound leverage of this carriage conquers the resistance of friction, and allows of augmenting the quantity of load. The horse carries the instrument of his power as a part of his burden. His speed, like that of a steam engine, would accelerate till the force and the resistance balance each other, or steadiness is attained.

You will excuse this to you needless amplification—to some of your readers it may afford clearer perceptions of the mode of operation than before; for this machine, though so simple when understood, at first seems complicate to those not familiar with mechanism.

There are sundry incidental advantages, besides, in this form of the carriage. In passing along curves, the outer wheels will turn as much on their axles as the outer line is longer than the inner line of the track, instead of slipping thus much. They will yield to this resistance, but ordinarily the weight of the load alone fixes the axle in the naves, because they meet with more resistance there than at the gudgeons.

In turning curves of the road, the manner in which the gudgeons are lodged, capable of a little retrocession, allows the flanch which touches the rail, to turn off from it. The flanches are, therefore, on the outside the wheel, and even in great velocity, it cannot gain upon the rail, because it must be turned off with force equal to that with which it acts.

To enable this rail-way carriage to go temporarily on streets, I make the secondary wheels of greater diameter, so that they may reach below the primary wheels and below the level of the rail. When the carriage arrives at the end of the road, *the pavement being there raised to its level, nearly, the secondary wheels take the ground and bear the load.* The main wheels being thus relieved, their axles fall a few inches into scores in blocks, placed on the side frames to receive them. They are thus suspended from use, but remaining in place, when the carriage returns to the rail-road and enters thereon, they rise from their repose, and take the bearing of the new load.

But to enable the carriage conveniently to traverse streets, and be guided, I make the frame in two divisions, and connect them with the bottom of the load body frame by pivot bolts, &c. and apply a tongue which shifts to either end. But these frames, at re-entering on the way, are secured in place.

Another mode mentioned in my specification of the improvement, of converting this carriage to street use, is, to adapt to it a pair of trucks, on which a lever or screw is placed, whereby to lift the fore part of the wagon, and let the hinder part run on the hind secondary wheels.

In the same manner a carriage may enter upon the deck of a ferry boat, and cross to an opposite rail-way, or to a city, as from Amboy to New York.

The superior *useful effect* of the compound carriage of Mr. Winans, may be shown by a very plain mode of calculation.

If we take $\frac{1}{113}$ the ratio of power to load, as the measure of friction of the English carriage, and the horse power at 112 lb. it is 12 lb. $\frac{8}{10}$ a ton. But the compound leverage carriage carrying 500 lb. with half a pound, thus *two pounds* a ton is the measure of *its* friction. But as this ratio was ascertained with only 14 inch and 7 inch wheels, the probability is, that larger wheels would perform better, on a firm and good rail-way.

If, then, we divide 112 lb. the power of a horse, by 12 $\frac{8}{10}$, it gives $8\frac{3}{4}$ tons the load of an English carriage on a level; but if we divide 112 lb. by 2 lb., it gives 56 tons the horse load, with the American, or compound carriage, on a level.

Gravitation operates equally against both, but on ascents the difference lessens, because the force down the plane, is in greater ratio to the friction of the new, than the old carriage; but still the difference will be an important saving again; for example; the force of gravity down the plane being as the height of the plane to its length, we may call 1 foot in a mile, the quotient of 5280 feet divided into 1

ton, which gives $\frac{4}{1000}$ of 1 pound for *one* ton, for *one foot* rise in *one* mile.

If the line is ascending, like the route from Philadelphia to Columbia, 27½ feet to a mile, the gravitating force down it per ton, is 11 $\frac{44}{100}$ lb., which added to friction 12$\frac{8}{10}$ lb. for the English carriage, is 24.46 lb. which divided into 112 lb. is 4 tons $\frac{57}{100}$, of which 3¾ tons may be loading. But if we add 2 lb. to 11.66, and divide into 112 lb. it gives 8¼ tons, of which 6 tons will be loading.

Thus, although our new carriage doubles the effect of power on this ascent, it is evidently much less than would have been its advantage had it been practicable to find a nearly level route.

Had a line from Harrisburg to Philadelphia been practicable with a slope of 2½ feet to a mile, one horse would have drawn 120 tons, of which 90 might have been loading, and he would have drawn up 36 tons, of which 27 would be loading. But it is justly expected that steam power will give ample usefulness to this route as it is.

Locomotive engines are considered in England now as saving 30 per cent. of the expense. They will be less expensive here with anthracite coal. There is already an improvement in boilers for using it.

Over and above economy in labour, it is of great consequence on long routes, to enjoy speed. It appears by the letters of the engineers of the Baltimore road, now in England, that in one place a locomotive engine of 10 horse power, on an inclination of 10 feet in a mile, runs at the rate of 15 miles an hour, drawing 12 loaded wagons, each loaded with 53 cwt. of coal, the whole 48 tons, and returns up at the rate of 10 miles an hour equally loaded.

If we suppose the compound carriages of Mr. Winans to be used with *such an engine*, their diminished resistance, or leverage, would enable its power to draw up that plane 160 tons, instead of 48. And if the ascent were 27½ feet in a mile, as on the Pennsylvania route, it would have drawn about 40 tons. It appears, too, that in some instances, they ascend 50, in some 72 feet in a mile, with considerable loads, or empty wagons that have been drawn down loaded.

To be able to transport from Philadelphia to Columbia in twelve hours, will be a facility that must assure the transit commerce to the canal. To cross the Alleghany with equal speed, will not be unimportant.

Another advantage from this carriage, when to be used with steam power, is, in rendering the rail-road itself less costly. The engines used in England, weigh generally 8 tons. Of course, the rail-road must be strong enough for loads of 8 tons; though the loads are but 4 tons. That weight of engine has not been considered a disadvantage, though it required double the quantity of iron in the road, because the adhesion between wheels and rails enabled it to draw the desired loads or trains without slipping. But we lessen the resistance of the loads so much, that a 4 ton engine will be sufficient, and the whole rail-road may be for 4 ton loads. This will, if the rails are wholly iron, according to Tredgold's tables, make a difference of one-

half that material item. On a route of great length, this saving will be no small amount of capital.

The evident superiority of effect, when the route is thrown into levels with stationary power, suggests a remark:—That where the intention is to use horses, as may generally be the case on our roads for some time, level roads will be the most useful. Stationary engines, to connect them, should not be considered disadvantageous, but favourable modes of operation. The apprehension that they may get out of order and interrupt the route, is allayed by the recollection that the power may always be divided between two engines *co-operating together*, but capable of working *separately*.

But there are other convenient modes of effecting the passage. You will recollect that Col. Long has converted the locomotive engine to a stationary one, for its own train. And that Mr. Robinson, civil engineer, in the service of Pennsylvania, has taken a patent for his neat invention of a moving water carriage, which being attached, descends, giving preponderance over an ascending train, and the water being discharged, it ascends empty with the next train, while another descends.

In conclusion, it may become an interesting question, how the transportation on a *state's rail-road* is to be managed, so as to produce the utmost economy and the fullest accommodation. The rates of toll must surely be sufficient to the revenues required. The expense of conveyance must be equal to the payment of the tolls, the expenses, and reasonable profits. While the privilege of an improvement in carriages which affords most economy, continues vested for a term, in private hands, the owners, perhaps, forming a corporate company, may carry on the whole transportation, and a state would consult its interest in encouraging this, provided they put on carriages and engines in sufficient number. What then would be the result? At the expiration of that term, the system would be established by experience. And the state might thereafter, by its agents, carry on the whole transportation, and derive a revenue from the profits of the carrying as well as tolls, and thus secure the great public objects of accommodation and revenue.

Should it be acceptable, I will for your next, or a succeeding number of the Journal, give a description of the anthracite boiler for travelling engines, with drawings.

Respectfully, yours, &c.
JOHN L. SULLIVAN.

EXPLANATION OF THE PLATES.

Fig. 1. W. Rail-road wheels.
S, W. Secondary wheels (in section.)
e, *e*, *e*, *e*. Ends of side pieces of frame.
a. Main axle.
b, *b*. Blocks on which main axle rests when suspended.
i, *i*. Iron rails.

c, c. Chesnut tree bearers.
P, P. Posts.
s. Protecting pavement with water cement.

Fig. 2. R. Rail-way.
C. Carriage in profile, showing the *under frames* to give obliquity to the axles when travelling streets.
p. Pavement.

Fig. 3. W. Main wheels.
S, W. Secondary wheels.
P. Pavement on to which the secondary wheel takes when the carriage leaves the rail-road.
I. The eye-bolt to receive the pin of the lever auxiliary wheels which bear the fore part, while the hind part is borne by the hind secondary wheels when on streets or roads.

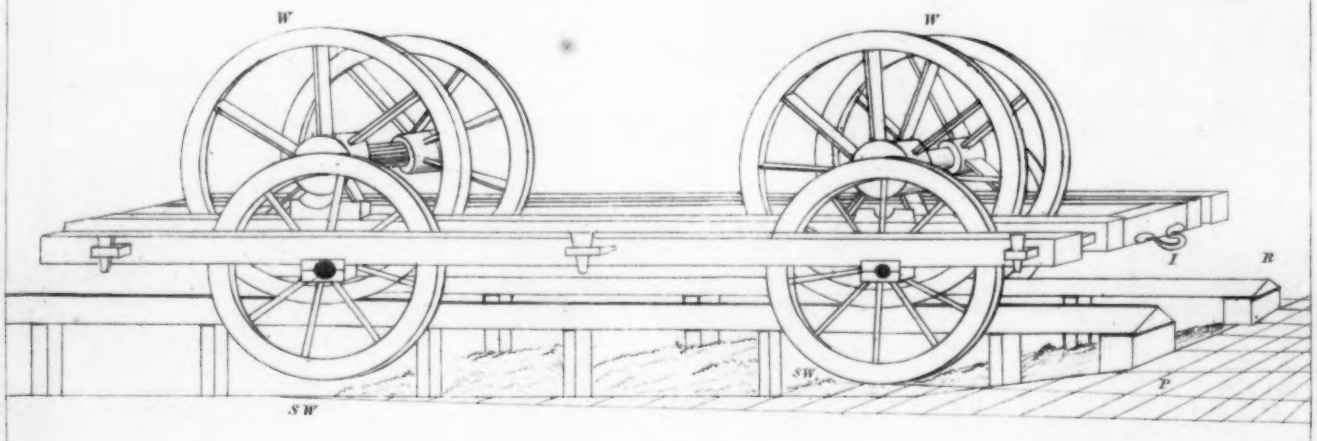
A novel and interesting case, explanatory of the law of Master and Apprentice; reported for the Journal of the Franklin Institute.

The commonwealth of Pennsylvania, at the relation of Henry Taylor, an infant, who sued by Gasway Oram, his guardian, *vs.* Gurdon Leeds.

Habeas corpus ad subjiciendum, awarded by the Hon. J. Huston, returnable before himself and the rest of the judges of the Supreme Court of Pennsylvania. Gurdon Leeds returned, that he held the relator by virtue of a certain indenture of apprenticeship, by which it appeared that the said Henry Taylor, aged 15 years on the 4th day of July, 1825, *with the consent of his sister, Margaret Leeds*, [who was the wife of Gurdon Leeds,] acting as his next friend, [his parents being dead,] had put himself apprentice to the said Gurdon, to learn the trade of a cabinet maker: to serve 5 years 6 months and 24 days; during which time the master was to find him in boarding, lodging, and washing, and give him *one quarter night schooling*, and when free, one new suit of clothes.

P. A. Browne, who volunteered his services for the relator on account of his being an orphan and poor, contended that he was entitled to his discharge. At common law, said Mr. Browne, the deed of an infant was absolutely void. Even an indenture of apprenticeship, entered into for his instruction and benefit, was not binding. 2nd Inst. 379. 3 Leon. 637, Mod. 15.; but the act of assembly of the 29th of September, 1770, declares, that "all and every person and persons that shall be bound by indenture to serve as an apprentice in any art, mystery, occupation, or labour, with the *assent* of his or her parent, guardian, or *next friend*, or with the assent of the overseers of the poor and approbation of any two justices, although such persons, or any of them, were or shall be within the age of 21 years at the time of making their several indentures, shall be bound to serve," &c., and the first question then was,

Fig. 3. *Plate 5.*



WINANS & SULLIVANS, RAIL ROAD & STREET CARRIAGE.

WINANS' AND SULLIVAN'S

Pl. VI. *RAIL ROAD AND STREET CARRIAGE* Jour.l Frank.n Inst.e

Scale 2 feet to an inch

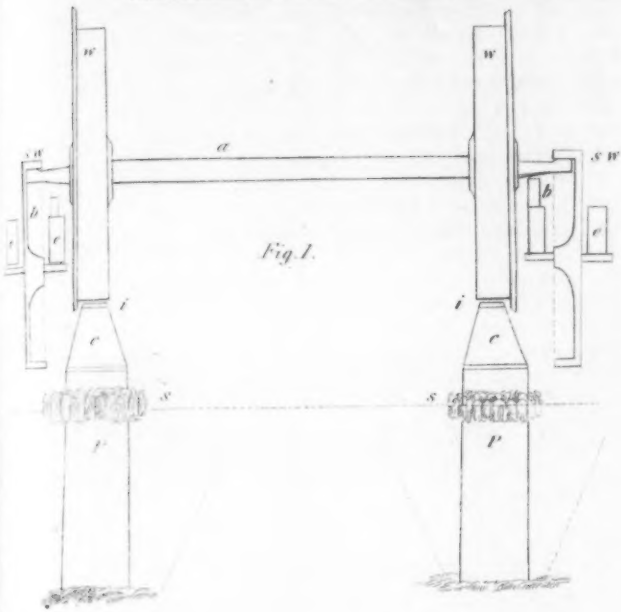
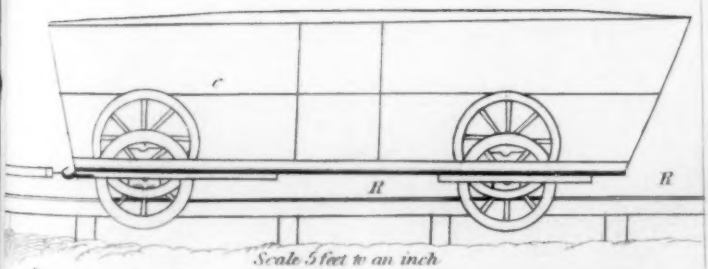


Fig. 2.



Scale 5 feet to an inch

P

whether it had been competent for the sister, *being the wife of the master*, to *assent* as *next friend* of the infant. He did not object to her on account of her relationship of *sister;* on the contrary, he admitted that where the parents were deceased, a sister might act as next friend. Nor, upon this view of the case, did he found his objection to the assent merely upon the ground of her being a married woman, for, according to the case of Commonwealth *v.* Eglee, 6 Sergt. and Rawle, 350, a *feme covert* may, in some cases, act in that capacity; but he contended that Mrs. Leeds could not, as next friend to her brother, assent to a binding *to her husband.* It furnished, he said, one of those glaring cases of conflicting interests, where the policy of the law obeyed the precept of religion, "lead us not into temptation." The obvious duty of a next friend in binding an apprentice, is, to procure the best terms for the infant; but how could the wife be expected to execute the office with fidelity, under the powerful attractions of not only her *duty* to her husband, but of her own interest. And he considered it not unworthy of observation, that in this indenture, binding Henry Taylor to serve for a very long period, he was to receive only *one quarter's night schooling.*

As a further proof that the situations were incompatible, he urged that the duty of a next friend was to watch over the master, and even over the mistress, [for much of the apprentice's comfort or suffering depends upon the female part of the family,] and see that they performed their covenants to the apprentice during his servitude. But, said Mr. Browne, how can this lady be called upon to watch over her husband? How can she be called upon to watch over herself? Mr. Browne contended that this indenture was void, not only upon principle, but upon authority. In the case of Commonwealth *v.* Kending, 1 Sergeant and Rawle, 366, an attempt was made to support an indenture upon the assent of one of these nominal next friends, but the court rejected it. There, Cyrus Pearce, who held the infant under an indenture, acted as next friend in binding her by a second one to J. H. Baker; and C. J. Tilghman, in delivering the opinion of the court, observed, that "he thought it would be of dangerous consequence to admit, that a man who was about to sell his apprentice, should take the place of *next friend*, because he must be supposed to be acting *for his own interest*, which is incompatible with the idea of guardian." So here, Mrs. Leeds was acting for her *own interest* in making unfavourable terms for the infant; for the interest of her husband was, by the laws of God and man, identified with her own.

He would also remark, that the chief justice considered the acting of next friend tantamount to taking upon herself the *guardianship*, and according to Osborne's case, Plowden 293, when a woman, guardian, marries, the husband partakes in the prerogative, so that the assent here given was, in law, that of Gurdon Leeds to a binding to himself, which was clearly illegal and void.

Secondly, this indenture not only purported to be made with the assent of his sister as next friend, but she had entered into a covenant for the faithful performance of the infant's covenants. It cor-

responds, in substance, with the instrument recited in the case of Meade *v.* Billings, decided in 10th Johnson, 99, where the guardian was held to be liable upon the covenant. But how can a married woman enter into a covenant? Especially if that covenant is to her husband? In Commonwealth *v.* Eglee, there were no covenants on behalf of the *feme covert*, but only an assent to the binding. In this case, she acted in *company* with her husband, and the presumption of law is, that she acted under his coercion. A felonious taking of goods under such circumstances, would not subject her to an indictment for larceny. A transfer of her estate under such circumstances, would be void.

F. W. Hubbell argued on behalf of the defendant,

1st. That Mrs. Leeds answered the description in the act of assembly, viz. "next friend;" the father and mother being dead, and the apprentice having no brother who had attained twenty-one, the duties of guardianship and maternity devolved on the eldest sister, and she was emphatically the "next friend." The act mentions no such exception as coverture.

2nd. That according to the strict technical rule of law, the disability of coverture extends to acts in favour of third persons, as well as to those in favour of the husband; in the latter, they are void upon the same *principle* as in the former; they only differ in *degree;* and that, therefore, when it was decided in Commonwealth *v.* Eglee, 6 S. and R. 340, that a *feme covert* may give her assent as next friend, under this act of assembly, the present case was ruled in principle.

In the same case, Commonwealth *v.* Eglee, the nature of this *assent* is thus defined: "it is a personal confidence reposed in her by act of assembly; she parts with no property, divests herself of no interest." A power or confidence reposed in a married woman unaccompanied with any *interest*, may be well exercised by her in favour of her husband, although the exercise of it require discretion, as a power of sale, &c. Coke Lit. 112, and 4th Cruise, 181. Tysee *v.* Williams, 3 Bibb's Rep. 368.

3d. The cases of purchases by executors, trustees, &c. at their own sales, have no analogy to the present case, although we should admit such an identity between husband and wife, as to render the exercise of a power in favour of her husband, in effect an exercise in favour of herself; for at law, such a purchase by an executor or trustee, when made in the name of a third person, is good. Equity interferes on grounds of policy. Such a case as *this* has never been agitated in courts of equity, and *technical* rules of equity, which preclude inquiry into the *real* equity, are not to be extended beyond their letter. Equity avoids such a sale, by putting the purchaser in *statu quo*, returning him the purchase money with interest, &c. Sugden's Venders, 433, and a tender of this is essential to the *cestui a que trust's* claim of relief. But here no offer is made of compensation to the master, for the instruction and sustenance of the apprentice, during the time he has been with the master—as yet he has

been only onerous; his services, after he acquired the trade, were to be the requital.

4th. That heretofore it has only been contended, that the fact that the next friend in the indenture was the wife of the master, does not *per se* vitiate the indenture. If there were *actually* an undue influence, it is otherwise. Nay, we are willing to admit that the law regards such a transaction with jealousy. If this indenture be subjected to scrutiny, even with such a disposition, it must be sustained; for there is no extraneous proof of undue influence, and on the face of the indenture we find all the usual covenants. It has been objected that the schooling covenanted for, is not sufficient; but it may be answered, that the boy was considerably beyond the usual age of binding, and so advanced in education, (as appears from his signature to the indenture,) that he did not need that more schooling should be stipulated for.

Lastly, that the act of assembly does not require the next friend to enter into any covenants, but merely to give *assent*. Therefore, the covenants by the next friend in this indenture, were merely surplusage, and could not vitiate it, *utile per inutile non vetiatur*. That the covenants by the next friend being entirely in favour of the master, it was he alone who could object it, if they were void.

Per Curiam Gibson, chief justice.

There must undoubtedly be an actual, and not merely a formal next friend. His office, however, is not to bind the apprentice, but to allow the apprentice to bind himself. The covenants of the apprentice, although executed under the supervision of those whom the law has set over him, are exclusively his own. Such are the provisions of the act of assembly, and such was the construction of it in the Commonwealth *v.* Eglee. The practice has, for the most part, been for the *prochein amy* to express his assent by sealing the indenture, but no one ever thought of having recourse to him on the contract, at least no instance of the sort has fallen under my notice. The reason is, that the legislature has not said that he shall become a party. The assent is sometimes expressed by subscribing as a witness, but neither in the one case nor the other has the *prochein amy* considered that he was binding himself for the apprentice. His covenant, if any existed, would be joint. But that would be inconsistent with his power, which is not to subject, by any act of his, the person of the apprentice to the dominion of the master; that can be done only by the apprentice himself. The *prochein amy* can join in the act only so far as the law gives him authority; and by the terms of the act of assembly, his agency is not to be active, but passive. The point was expressly ruled in the Commonwealth *v.* Eglee, where the coverture of the *prochein amy* would have afforded a decisive objection, if she had been considered a party to the deed. That case establishes also, that the subjection of a *feme covert prochein amy* to her husband's will, is not, in contemplation of law, inconsistent with the free exercise of her will in the execution of her trust; and this, in analogy even to the common law, which permits a wife to act in a representative capacity, and independent of her husband, wher-

ever the subject matter is unconnected with his interest or marital rights. The pinch of the case here, is, that the binding was to the husband. But in equity, and even in some instances at the common law, wherever a *feme covert* has power to act as if she were sole, she may treat directly with the husband. As, however, the matter depends on construction, it is urged that expediency requires that the act of assembly be so interpreted as to avoid the tendency to abuse of power, which must necessarily exist in every case like the present. That would be a grave consideration, were abuses of the sort not subject to redress. But an effectual corrective may be found in the supervising powers of the judges, who are bound to discharge wherever the contract is shown to be tainted with actual fraud or collusion, and in a case like the present, the transaction would be more strictly scanned than if the binding were to a stranger. We will not, however, discharge, of course, where, as in this case, the covenants appear to be reasonable and proper on the face of the indenture, especially where the application is not made till the apprentice has ceased to be a burthen. It is objected that the quantum of schooling is unreasonably small. It appears, however, from the apprentice's signature to the indenture, that he wrote a fair hand; and the great object of the binding being to learn the art and mystery of the master, I would hold an indenture valid, without any covenant for schooling at all, if it should appear that the education of the apprentice had been sufficiently attended to before. It, therefore, appears to a majority of the court, that no reason had yet been shown why the apprentice should not be remanded.

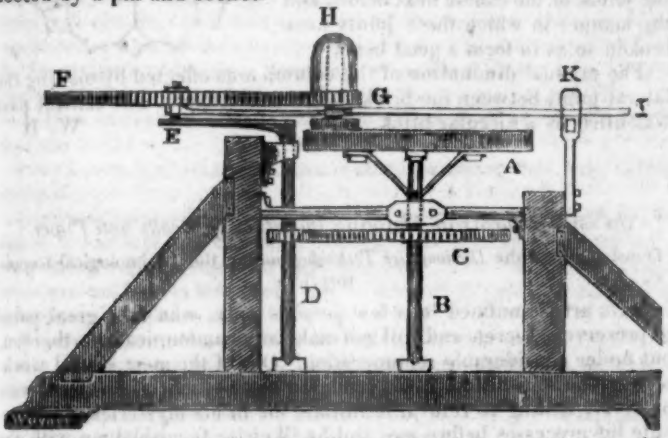
Tod, justice, dissented.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a Machine for Grinding Painters' Colours, Printing Ink, &c. Invented by W. J. Stone, *Engraver, Washington, D. C.*

Various machines have been invented for the purpose of grinding colours, which, however, are applicable only in the large way. In my own business I have felt the want of one which would answer well as a substitute for the ordinary stone and mullar, and have constructed an apparatus for this purpose, which I have found to fulfil my expectations. The annexed drawing will serve to explain its structure. The principal frame is made of wood, properly braced together, and need not be described. A, is a round table, or slab of cast-iron, turned, and ground flat on its upper surface. This is supported by a shaft B, running upon a pivot below, and supported by a collar above, so that it may turn freely. To the cog wheel C, fixed upon this shaft, motion is given in any suitable way, as by another cog wheel geared into it, and turned by a crank, or a whorl upon the shaft, acted upon by a drum and strap. This cog wheel takes into a pinion, on the second shaft D, which has an arm E,

projecting from, and standing at a right angle with it. A cog wheel F, is firmly fixed by its centre, to a pin rising from the arm E. This cog wheel turns a pinion G, on the mullar H, which mullar is in two parts, the upper part, H, which serves as a weight, which may be increased or decreased at pleasure, and drops upon a square pin projecting from the lower, or grinding part. This pin is round, where it passes through the arm I, to admit the wheel F, to turn the pinion G, and consequently the mullar. The arm I, turns freely upon the pin projecting from E, and slides freely through a hole in the swivel K, the upper and lower part of which are connected by a pin and socket.



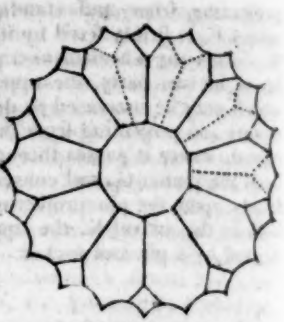
It is unnecessary to describe the action of the machine, as this must be evident from its construction. It will also be seen that the length of the arm E, must be proportioned to the diameter of the table A, that it may carry the mullar to the right distance from its edge, on either side. W. J. S

On the form and arrangement of Bricks used by the ancients in the construction of Fluted Columns.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—In a late visit to the city of New York, my attention was attracted to the church now being built in Canal street. Its front appeared to be a copy of that of the temple of Theseus at Athens. The ingenious arrangement of the bricks to produce the fluting of the columns, recalled to my memory the following contrivance used by the ancients to produce the same effect, and which I send you, with a hope that it may afford a useful hint to some of our architects.

In examining, several years ago, the ruins of Pompeii, I noticed several doric columns broken off a few feet from the ground, and this circumstance gave me an opportunity of observing their internal structure. I found they were composed of bricks of two different forms and sizes, as in the annexed diagram. The full lines show the form of the bricks, and the dotted lines show the joints of the course next below, and the manner in which these joints were broken so as to form a good bond.



The gradual diminution of the column was effected by making the lateral joints between the bricks larger at bottom. The central part was filled by a circular brick. W. H.

On improvements in Marbling the edges of Books and Paper.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

This art is confined to a few persons only, who take great pains to preserve it secret, and will not make any communications thereon, but under considerable remuneration. One of the most skilful workmen in Paris, to whom I had rendered some essential services, was, however, willing in return, to initiate me in his mysteries, and execute his processes before me; and he likewise furnished me with the necessary details, to enable me to describe them; not, however, without my engaging to conceal his name, lest it might draw upon him the animadversions of his fellow-workmen. The following is the process:—

The utensils employed by the marbler are not very numerous:—First, a vat, formed of oaken planks, well fitted together, so as to be perfectly water-tight. Secondly, a small cylindrical staff. Thirdly, several earthen vessels, to contain the colours and other preparations. Fourthly, a small portable stove, or furnace. And fifthly, a grinding stone, of porphyry or marble, and a mullar, to grind the colours; these are indispensable requisites.

On the preparation of the gum.—Put into a proper vessel, half a pail full of water, or about eight or nine quarts, and dissolve in the cold, about three ounces and three-quarters of gum tragacanth, stirring it frequently for six days: this is termed the *couch*, or *bed;* and upon this bed are to be spread the colours which serve to form the marbling; they do not, however, mingle with each other. This quantity of gum is sufficient for marbling the edges of four hundred volumes.

A solution of gum, much stronger than the above, must likewise be provided, in order to increase the thickness of the bed, when

necessary; of which proof is to be made in the manner to be hereafter described.

Preparation of the ox-gall.—Put the gall into a dish, and add to it an equal weight of water, and beat the whole up well together; then add to it ten drams of camphor, which has previously been dissolved in one ounce of alcohol, and again beat up the whole thoroughly, and pass it through a filtering paper. This preparation should not be made earlier than the day before it is to be used, lest it should spoil by keeping.

Preparation of the wax.—Over a slow fire, and in a glazed earthen vessel, melt yellow virgin wax; when it is melted, it is withdrawn from over the fire; and then mix with it, by degrees, and stirring it continually, a sufficient quantity of essence of turpentine, to give it the consistence of honey. Ascertain when it has attained the proper degree of fluidity, by putting a drop of the mixture upon the nail, from time to time, and let it cool; and add more of the turpentine if it is too thick.

Like the ox-gall, the wax must not be prepared too long before using it.

Of the colours.—We do not employ the heavy mineral colours in marbling; animal and vegetable colours, and the ochres, are the only ones which can be employed with success. The other mineral colours are too heavy, and could not be supported upon the surface of the gummed water.

For yellow, we employ Naples yellow, or the yellow lake from weld. The golden yellow is made with *terra de Sienna*, in its unburnt state.

For blues, of different shades of strength, use the best indigo, known by the name of "the flower of indigo."

For red, either employ carmine, or carmine lake.

For brown, umber.

For black, ivory black.

The white is produced by the gall itself.

Green is produced by the mixture of blue and yellow.

Violet, by yellow and red.

And aurora, as in ordinary paintings.

The *terra de Sienna*, the flower of indigo, and the carmine lake, are employed separately, in the manner we shall describe, and make very fine and sharp figures, which may be varied to infinity.

On the preparation of the colours.—These are to be ground very fine, and made into mixtures, of the consistence of a thick soup, or *bouillie*, either upon the slab of porphyry, or one of marble, with the prepared wax and water, together with a few drops of alcohol. When they are well ground together, take up a small quantity of the colour with a palet-knife, which is inclined, to let the colour fall upon the surface of the gummed water, to prove its consistency. When each colour is ground and mixed up, it must be put into a pot, and kept apart from the others.

On the preparation of the marbling vat.—From the vessel which holds the prepared gum, take a sufficient quantity of it to cover the

bottom of the marbling vat, to the depth of an inch at least. Then add seven ounces of alum, in fine powder, and beat it well up, to dissolve the alum. Put a spoonful or two of this prepared water into a conical confectionary pot, in order to make the necessary trials with it, to ascertain whether the gummed water be of the proper consistence for use, as follows:—

Take a little of the colour which has been ground of a sufficient consistence with the prepared ox-gall, and throw a drop of it upon the gummed water in the conical pot, and stir it in a circular manner with the small rod. If it extend well, and form a spiral figure, without dissolving in the gum, it is sufficiently strong; if, on the contrary, the colour will not turn, the gummed water is too thick, and water must be added to it, and be well mixed with it, by beating it up; but if the colour spread too much, and dissolve in the gummed water, then some of the stronger prepared gum water must be added to it, which was kept in reserve for this purpose. At every time of adding either water or gum, the whole must be well beaten up to make the mixture perfect. After every trial, the conical vessel must be emptied, and its contents thrown aside, and a fresh portion of the gummed water employed. When the gummed water has thus been brought to the desired consistence, it must be passed through a sieve into the marbling vat, to the height of an inch, as we have before said.

The marbling vat being thus prepared, and all the colours ground and thickened with the prepared wax, and ox-gall, so that they be not either of too thick, nor of too thin, a consistence, first take the gall, and spread more or less of it upon the gummed water. The colour first thrown on is to be less thick than the succeeding one, and that again thicker than the first, and so on. We first throw on the red for instance. All the other colours intended to be used are then thrown on, one after the other; that which is laid on second, presses the first on all sides; and as the number of the colours is the more considerable, so the first is spread, and occupies a larger space. When all the colours which we would employ are thrown on, if we desire that the marbling should take the form of a volute or spiral, we hold the rod upright, and then carry it along amongst the colours in a spiral manner. The colours are thrown on with a kind of pencil made by the marblers, thus:—They take for the handles the twigs of osier, about a foot long, and two lines in thickness; they also employ about a hundred hog's bristles for each pencil, and of the greatest length possible; they arrange these bristles all around the smaller end of the twig, and tie them strongly with packthread. These pencils, with their long bristles, more resemble brooms than pencils. With the assistance of these pencils, they throw on, here and there, all over the gummed water, the first colour; then, in the middle of that, the second; then the third, &c.; so that when they are spread, these sets of colours approach one another; they then stir them in a spiral or other shape, as they judge necessary. We shall give an example:—

Suppose we would give the marbling the form known by that of

"*the partridge's eye.*" We prepare two tints of blue with the flower of indigo; the one, such as we have before-mentioned, and which we designate by the name indigo, No. 1; the other, in a different vessel, and to which we add a larger proportion of the prepared gall, and term indigo, No. 2, we first throw on the carmine lake; secondly, the *terra de Sienna;* thirdly, the indigo, No. 1; and fourthly, the indigo, No. 2, to which has been added, before throwing it on, two drops of essence of turpentine.

The blue, No. 2, last laid on, extends all the other colours, and affords a clear blue in spots, which produces a fine effect. It is to the essence of turpentine that this effect is owing; we should therefore add a little of it to all the colours which are to be thrown on last; it would be useless to mix it with the preceding ones.

When all is thus disposed, the marbler takes eight or ten volumes, and commences by marbling their front edges, which he first prepares by laying the back of each volume upon a table; he then turns back the boards, and applies a clamp, which he affixes by screwing its jaws close, and thus levels the front edges. He does the same with all the other volumes; he then takes each up between both his hands, and plunges it into the vat. Thus the front edges are marbled.

He then takes the same volumes, loosens the clamps, and strikes upon their ends to make them all enter the gummed water at the same level; he then again clamps them and treats them in a similar manner.

The marbler can vary his patterns *ad infinitum;* they depend upon his taste both in the arrangement he gives to every colour which he employs, and in the number of the colours used.

Paper is marbled in the same manner, and with the same colours, prepared and thrown upon the gummed water in the vat, as the edges of books. But instead of using a round staff, we use combs, with teeth more or less apart, to form the volutes, or any other figure we please, and which may be varied to infinity.

All the address consists in adroitly placing the sheet of paper flat upon the surface of the gummed water which supports the colours, and to withdraw it again without deranging them. In order to do this, the workman takes between the thumb and fore-finger of one hand, the sheet, in the middle of one of its ends; and with the other hand, and between the thumb and fore-finger also, the middle of the other end of the sheet. He then lays the sheet upon the gummed water, and again removes it, without suffering it to slide upon the coloured surface. He then hangs the sheet upon the bar of a frame, with the coloured side outwards, to evaporate the water, and to dry it.

This sheet being thus finished, he marbles a second, and so on; but he always adds fresh colours after every one is dipped.

When the sheets are dry, they are waxed, glazed, and folded for sale.

On Morocco Leather Dressing.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

The true Morocco leather is made of goat skins, tanned and dyed on their outsides. Sheepskins are treated in a similar manner. It seems that this leather is termed *Morocco* leather, from the art of dressing it being originally brought from that country.

This manufacture was established in France, towards the middle of the eighteenth century. The first accounts of the manufacture of Morocco leather in the Levant, were given by Granger, a surgeon in the royal navy, and an excellent observer; who made voyages to different countries, by order of the minister, the Count de Maurepas; and successively transmitted to the Academy the most valuable discoveries in divers branches of the manufactures, as well as in natural history. His description of the art of dressing Morocco leather, which, with other processes, he saw executed in the Levant, is dated in the year 1735, and the details of it were published by Lalande, in the Encyclopedia. Since this period, many establishments for dressing Morocco leather have been formed in France, and especially that of M. Fauler, at Choisy-le-Roi, which is become the most important and celebrated, for the superiority of its products.

It would be useless for us to describe the details of this manufacture in its commencement; and which followed the processes described by Granger, and published by Lalande. They have also lately been much simplified in their manipulations, and improved in others which were hurtful; so that the manufacture has received some real improvements. We shall now proceed to describe several of these ameliorations.

The skins which are employed in this manufacture, are, as we have above said, those of goats and sheep. The first of these are not only more pliant, but their surfaces are smoother, and they are likewise more durable than those of sheep, but their employment is restricted, on account of their high price.

The manufacturers in Paris procure their goat skins from various places; in France, those from Auvergne, Poitou and Dauphiny are preferred. They also procure quantities from foreign parts, and especially from Switzerland, Savoy, and Spain; the last, in particular, are much sought for, on account of their strength and other good qualities; so also those of France are esteemed for their thinness. The manufacturer has it thus in his power to make his choice in regard to these qualities, and also to lay aside those skins which appear defective, or are unfit to receive the finer dyes, especially the reds. It is nevertheless impossible, with all his care, to perceive in this selection the slight cuts made in the skins by the knife of the flayer; or the small lumps left in them, from the punctures of insects, but which are, however, sufficient to render the skins greatly defective, when they are to be dyed red, which is a colour the most delicate, and requires the highest perfection in the skins: and thus the

manufacturer is frequently obliged, in the progress of the manufacture, to submit his skins to new inspections, and to class them for dying; that is to say, to reserve the defective ones for the darker tints, and employ the finer ones for the brighter colours, and especially for the reds.

The goat skins are received in packs, in a dry state, and therefore the first process they are subjected to is intended to soften them, and to open their pores, in order to enable the substances employed in the succeeding operations to penetrate them. This object is readily obtained by immersing them in stagnant water for a longer or shorter time, according to their degree of dryness, their thickness, and the temperature of the season. In this first steeping they undergo a kind of fermentation, which cannot be carried too far, without danger of their beginning to putrefy, and consequently necessarily altering their quality. It is practice only which can guide them, as to the length of time required in steeping them; and which may be from two to five days. When they think that the skins are sufficiently softened, they avail themselves of this state to give them their first dressing upon the horse, in order to separate any morsels of fat or flesh which the butchers may have left upon them, and which were not visible in the folds which were formed in them during their drying. After this preparation, they are again steeped in fresh and cold water for twelve hours, and are lastly rinsed in similar water.

When the skins have been well drained, they are put into square pits, filled with lime, mixed more or less with water. These pits are generally constructed of stone or wood, and are about four or five feet long, and as many deep. The intent of this new immersion is to dilate the reticular tissue, and thus to loosen the roots of the hair, and permit it to be removed easily. In this, as well as the preceding operation, certain changes occur, which habit only can indicate. Thus, it is by no means a point of indifference to leave the skins for a longer or shorter time in the lime; it is also necessary to graduate its action, and to follow a series of continued observations, in order to seize the precise moment when the proper effect has been produced; as, otherwise, the lime, by too prolonged action, may exercise an injurious influence, and the skins will become swelled and spongy. We thus see, that we must carefully guard against the corrosive action of the lime, according to the greater or less fineness of the skins, and the temperature of the atmosphere; as it is certain that its action is greatly accelerated, when the heat of the air is increased.

In order to proceed with more certainty, the steeping of the skins in lime-water is usually commenced in those pits where, from length of time, the lime has become partly carbonated, by remaining in contact with the air, and its action has become less energetic, and then to finish with those pits in which fresh lime has been put. It is also necessary in this process to observe a due period throughout; and that its progress be neither too quick nor too slow. If the pit be too strong, it will be seen that the skins are powerfully attacked by

the lime, after a day or two's immersion, and it becomes necessary therefore to remove them into a weaker one. If, on the contrary, we find at the end of twelve or fifteen days, that the hair is not loosened, then we must have recourse to a pit capable of acting upon them with more power. We must also take care, during each immersion, not only to lift the skins from time to time, in order to permit the lime to renew itself, and to penetrate both sides of the skins, but we must also take them out of the pit, and replace them again, at least once in every two days' time.

When they have been steeped for the proper time, they are taken out of the pits to be scraped, in the following manner:—Each skin is stretched over the horse, and with the aid of a blunt round knife, similar to that used by the tanners, the hair is removed; in order to do this, it is sufficient to pass the knife backwards and forwards over the entire surface of the skin, at the same time exerting a slight degree of pressure. This operation being finished, they proceed to the succeeding one, which consists in completely freeing the skin from the particles of lime contained in it; this is highly essential to the final success of the process, which the lime would entirely frustrate, by giving to the dyes a great number of shades, which, from their multiplicity, would be exceedingly expensive to remove. This process has, however, lately been greatly simplified, without lessening the final perfection of the work. They commence by laying the skins to cleanse themselves in a river for one or two days. They then proceed to clear the skins from any small portions of flesh which may still adhere to them. This operation requires great care, and considerable practice, to detach them cleanly, and without injuring the skins. At this time also they shave and equalize the thickness of the skins.

They next dress the hair sides of the skins with the *querce*, which is a long flat plate of stone, of a fine and hard quality, being a species of hard schistus, and which is enclosed half its width in a piece of wood, of which the ends project eight or ten inches on each side, and are rounded, to serve as handles; this species of blade, or stone knife, has its edge rounded; with this instrument they expel, by the slight pressure they exert in using it, the last remains of the lime which adhered to the skins, and at the same time soften the hair sides of them. Then, after having well drained the skins, they repeat the process of rubbing upon the flesh sides of them, and compressing them strongly upon the horse, with the round blunt-edged knife; they are now ready to undergo the preserving process.

Formerly, between each operation, and they were very numerous, they pressed and beat the skins in wooden vats, by means of wooden rammers or pestles. But now they are content to beat the skins about for a quarter of an hour each time, in a barrel, mounted horizontally upon two necks or pivots, and the inside of which barrel is furnished with a great number of wooden pins rounded at their ends. They introduce the skins into this vessel, and a quantity of water proportioned to their number; and, after closing it, they turn it rapidly round by means of a handle or winch affixed upon the axis

of a toothed wheel, which acts in a pinion affixed upon the axis of the barrel.

We have before spoken of the inconveniences which the lime occasions when its action has been too long continued; and we may now add, that it was no doubt in order partly to remedy these that many manufacturers diminished the quantity of the lime, and supplied its want by employing a proper proportion either of wood-ashes or of common pot-ash; and which probably produced the same advantages without being attended with those inconveniences. We are besides strengthened in this idea, by the knowledge, that other persons have recommended the employment of stale urine for similar purpose, and which we regard as infinitely preferable for this kind of work, probably on account of the ammonia which it develops. It seems to result, from this reasoning, that those alkalies which are the least caustic, merit the preference, whilst they still possess their cleansing properties, and they are easily removed by slight washings; whereas the lime is much less soluble, and, in the state of division in which it is employed, it introduces itself within the pores of the skin, where it remains; and combining with the organic matter, communicates new properties to it. It is certain, that let them take all the pains possible to remove the last remains of the lime, not only do the skins preserve their rigidity, but the presence of this alkaline earth acts as a kind of mordant upon the dying materials employed, and modifies them so as to produce many various tints totally different from that which was designed to be given to the leather.

We see, after what has been above stated, how very important it is that the lime should be entirely extracted; and it is this, doubtless, that rendered necessary the preliminary operations before dying the skins; nor can we otherwise conceive the utility of that which is termed *le confit*, an operation with which we are now occupied.

In the description of this process, published by Lalande, we find a third bath mentioned, to which he gives the name of *le confit;* this is nothing else than dog's dung, mixed with water to the consistence of thin soup, and in the proportion of from twenty-five to thirty pounds for eight dozen of skins. The author pretends that this *confit* removes their rawness, and disposes them to soften or swell during their fermentation; and, which is more, that this dung cleanses the skins by the action of the alkaline parts which it contains, and facilitates the removal of the grease which they retained, and which hindered them from taking the desired colours. Now we are ignorant upon what facts these various assertions are founded; and we must say, that it is scarcely likely that the skins should retain any appreciable quantity of grease after the cleansing processes they have been subjected to, and where the lime and the potash employed must necessarily have produced the effect of converting it into a soap more or less soluble. We may then suppose that the real utility of this bath is to bring on that species of acid fermentation which precedes putrefaction. What leads us to this belief, is, that we know most of the manufacturers of Morocco leather have entirely discon-

tinued the use of this dung-bath, and only use a sour bath made with bran, which can only produce a certain proportion of acid; and if this be the case, *this* confit, we apprehend, must operate upon the skin, principally in consequence of the acid thus generated removing that portion of the lime which the skin may have retained. We also believe that it is this acid which produces the swelling spoken of by Lalande, and which he believes tends to prepare them the better for tanning.

However this may be, when the skins have undergone the different processes, and have been well washed, they are last immersed in a bath of sour bran, where they are left for a day and a night; they are then hung upon the horse to dress or clear them, and those which are intended to be dyed red, that is to say, the finest skins, are immediately salted, in order to preserve them until they are to be dyed.

We may observe, on this last point, that the salt most probably performs another office, and that it not only preserves the skins, but it is a fact, that whenever salt comes in contact with soft animal substances, it first swells them up; but it afterwards causes a great part of the water which they had absorbed, to flow out; and then makes them shrink. This effect is particularly remarkable in the intestines of animals which are salted in order to preserve them; and we do not see why the same effect should not happen with respect to their skins, the cellular tissue of which is contracted by the salt; and as the salting precedes the dying, it may be presumed that it also favours the latter process, by rendering the surface of the skin more compact and smooth. Another advantage likewise results, which is, that the skin becomes less porous and more difficultly penetrated by the dye, and which consequently can be used with more profit. From a similar motive, each skin is folded double, and stitched along its edges, with its hair side outwards, in order that the dye may not be applied to the flesh side.

[TO BE CONTINUED.]

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS GRANTED IN JANUARY, 1829.

With Remarks and Exemplifications, by the Editor.

1. For a manner of *Preparing White Lead for Painting*, without grinding; John Barney, New Haven township, Huron county, Ohio, January 2.

This is a process for rendering white lead miscible with oil, without the trouble of grinding. The means prescribed are simple; the paint, according to the declaration of the patentee, dries with a finer surface than that from ground lead; whether it will stand equally well, requires the test of time. Being a recipe, we do not publish it without permission.

2. For *Drying Cut Tobacco,* in tobacco factories; George Campbell, Schenectady, New York, January 7.

The patentee states that it has, heretofore, been the practice of tobacconists to dry their cut tobacco upon tables of the ordinary construction, which, in large establishments, demands a great deal of room, the want of which produces much delay. The improvement for which the patent is obtained, is the use of a number of tables placed one above the other, allowing an interval of five inches between each. They may be variously constructed, so as either to be moveable or stationary, with or without framed corner posts, &c.

In the plan represented in the drawing, all the tables are made to let, or lower down, so as to lie flat upon the lower table; the upper one is then covered with tobacco, and raised into its place, and the whole, in succession, charged in the same way.

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3. For a *Washing Machine,* called the "Complete Washer;" Reuben Mosher, Galway, Saratoga county, New York, Jan. 8.

Should this washing machine excel its predecessors in utility, as greatly as the length of the specification transcends that of the larger number of them, it will justify its name, and be a *complete washer.* We have repeatedly noticed the great number of patents issued for washing machines, and are really of opinion that this number actually exceeds that of all the individual washing machines in use in the Union, with the exception of the simple fluted board.

There is in the present machine, a display of a considerable degree of ingenuity, and, perhaps, too much complexity; we can only give its leading features; those who wish the details, may apply to the patentee, who will be glad to sell them a machine.

There is an oblong box, or trough, a fluted cylinder, standing across this box, with gudgeons and a crank to turn it. Below the cylinder, and within the trough, there is a moveable bottom, called a shoe, which is made concave in the middle, to correspond with the convexity of the roller. Across this shoe, there are small rollers, thirteen in number, between which and the large roller, the clothes are to pass. This false bottom is borne up by spiral springs, which act upon it through the medium of sliding rods, on the outside of the trough. There are contrivances for increasing or decreasing the pressure, according to the nature of the articles to be washed.

It is at first proposed to make the large roller of one solid piece of timber; but a second method named, is, by spiking plank on to circular ends, the pieces being fluted, as in the former. The points claimed are,

First. The construction of the great cylinder, as last described.

Second. The mode of tightening or relaxing the springs.

Third. The mode of raising or lowering the large cylinder.

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4. For a *Thrashing Machine;* James S. Wood, Pattonsburg, Botetort county, Virginia, January 9.

(See the specification.)

5. For a "Variator" for taking the *Measure for Cutting Clothes;* Levi Peterson Lemont, Bath, Lincoln county, Maine, January 9.

The machine called the *Variator,* is an upright post, rising from a stool, or block, to the height of about six feet; from this project arms, which are made to slide up and down in long mortises, or slots, with a number of wooden pins, swivels, gauges, graduated tapes, scales, &c. &c.; twenty-one particular parts being enumerated. Against the variator, the person to be measured is to stand, when the various moveable parts of the machine are to be so placed as to designate certain heights, lengths, and widths, whilst circumferences, and segments of curves, are ascertained by the graduated tapes. We are altogether unlearned in the art and mystery to which this machinery is to be applied, and therefore beg leave to be excused from saying any thing of the merits of an article which we have not the talent to analyze.

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6. For *Combs* to be made of wood, ivory, horn, &c.; Samuel Lambert, Hanover county, Virginia, January 9.

"This invention consists, in fact, of two combs, the one generally finer than the other; they are usually about two inches and a half long, and one and a half wide." They are made "so that two of them shall protect each other, by the passing of the ends of the teeth of each one, into a groove in the back of the other." "When the combs are so locked, or shut together, the ends form the segments of a circle; the backs are so finished that they appear round, or cylindrical, and the combs are finished so smoothly and neatly, as to be used with great convenience as pocket combs."

We are told that combs similar to the above have been, for a considerable length of time, on sale, manufactured and brought into market, by different persons; they certainly did not appear to us under the form of new acquaintances. For the interest of the patentee, however, we hope there is enough of novelty in them to sustain his claim, as they are sold sufficiently cheap to meet the wants of the public.

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7. For a plough denominated the *Prairie Bogging and Ditching Plough;* John Gordon, Capec, Columbia county, New York. Assigned to Jona. J. Coddrington, New York, Jan. 13.

This plough, as its name indicates, is to be applied in bogs, or meadow ground, only. The standard of iron is attached to the beam in the usual way, and screwed on the inner face of the *land side,* as in the common plough. The *land side* is of cast-iron, about 6 inches deep, 1 thick, and 3 feet long from heel to toe, with a pin or blade on the bottom edge of the *land side,* about two inches wide at the heel, and narrowing to a point nearly opposite the standard. This blade is to make a horizontal cut, at the bottom of the bog; there is

fastened to it, by screws, a sharpened steel blade, or cutter, of such size and form as to make a horizontal cut in shaving the bog from the soil, of about two feet. In front of this there is, attached to the beam, a vertical steel cutter, of about eighteen inches in length, six in width, and one in thickness at the back; this is brought to a perfectly sharp edge; it is curved back, so as to cut with the greater facility. The mould board is not formed to turn the sod, or bog, over, but to slide it out of the furrow, to be afterwards removed. A draft bar passes through a mortise in the beam, standing at right angles with it, and being about two feet in length. This is to afford to the team a parallel draft on the land side of the beam. "Thus, in the manner of using, the team travels on the unploughed land, by means of the draft bar, the horizontal cutter enters lightly upon the surface, cutting the bogs, roots, stumps, &c.; the vertical cutter separating the cleft turf from the land, whilst the mould board forces it from its bed, leaving the ground surface level, and completely cleared for tillage."

"What I particularly claim as my exclusive right, is, the application of the *draft bar*, to the said plough; and its general application in cutting bogs, and ditching in prairies, and bog meadows."

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8. For a machine for the *Cleaning of Paper Rags*, by which great expense and labour are saved; William Debit, East Hartford, Connecticut, January 13.

(See specification.)

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9. For an improvement upon mills, being a mode of *Supplying Water to Water Wheels;* John Haughton, Greensborough, Green county, Georgia, January 13.

The plan or plans of Mr. Haughton are such, in part at least, as have been frequently proposed, sometimes essayed, and always found to disappoint the hopes of the projector. One part of his plan may answer very well in certain situations, where there is a stream with a strong current, and the banks unsuitable or inconvenient for the erection of a mill. It is proposed in this case, to erect a water wheel to be driven directly by the current, for the purpose of pumping up water to be conducted in pipes, or troughs, to such a place as may be preferred for a mill, and there to use it to drive an overshot wheel.

Another plan is to use horses, or other animals, upon an inclined wheel, to pump up water from a pond, stream, or well, to such a height as to drive a water wheel by its fall.

Although the horses or oxen employed in this way would not perform more than one half the effective labour which might be derived from a direct application of their weight and muscular strength, there would still be some power left, and the patentee may, therefore, console himself in some degree, by referring to the plans which have been devised and patented, to cause a wheel to pump up water enough to drive itself, and propel weighty machinery.

10. For improvements in the *Manufacture of Salt;* J. A. Teissier, Boston, Mass. January 13.

This patent has been recently surrendered, and a new specification filed, in consequence of some defects in the former. The new patent will come under regular notice at the proper time.

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11. For an improved *Press,* formed by a new and powerful combination of cranks, or wheels, and levers; Thomas Bakewell and John P. Bakewell, Pittsburgh, Alleghany county, Pennsylvania, January 14.

The principle upon which this press operates, is that which is usually known by the name of the *toggle joint.* The patentees state that it consists of "three principal moving parts, by which the effect is produced, and the combination of which we claim as our invention."

"These three parts we denominate, *first,* the lever, or crank, by which the power is applied. *Secondly,* the pitman or connecting rod, by which the power is transmitted to the *third* part, or sliding piece, or head, by which the effect produced by the other parts of the press is communicated to any substance exposed to its action."

To us it appears very similar to several of the modern printing presses, to many seal presses, working with the toggle joint, and various other machines, in which the power of the lever, as it vanishes, becomes infinite; that is, when a right line extending from one of the extreme points of action to the other, would pass through the fulcra. It is said in the specification, "a different combination of the above described principle may be applied, in case it shall be found more convenient, by substituting for the above described first part, or lever, a crank, or cranks, which are to be connected with the sliding head, by means of one pitman rod, or more, and joints as above described, care being taken to regulate the said pitman rod, or rods, so that it, or they, shall form with the crank, or radius thereof, if the crank be curved, a right line between the axis of the crank, and the base of the press, at the time the greatest pressure is required."

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12. For an improvement in the *Mill for Grinding Apples;* David D. Demarest, New Milford, Orange county, New York, January 14.

(See specification.)

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13. For a *Washing Machine;* Amos Larcom, Watervleit, Albany county, New York, Jan. 16th.

This machine bears considerable resemblance in its action to that described, No. 3. There is an oblong trough and a drum, but the drum, instead of being fluted, is covered with rounds, so as to appear reeded. Within the trough and under the drum, small rollers cross, forming a concave, within which the drum revolves, and between

which and the drum, the clothes pass. The gudgeons of the drum pass through sliding pieces, confined by vertical boxes on the outside of the trough, the slides being forced down by spiral, or other springs, to regulate the pressure of the drum upon the clothes.

The patentee says, "what I claim as new in the above machine, is, the construction of the drum, the periphery of which is formed of rounds, or slats; and the use of springs to adapt it to the quantity of clothes passing between it and the rollers.

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14. For a wheel for *Spinning Wool and Cotton* by hand; called the "Ohio Spinner;" Nathaniel Harris, St. Clairsville, Fairfield county, Ohio, January 21.

This is a contrivance of much simplicity; what novelty and utility it may possess, we shall leave to the determination of others, after furnishing an outline of the structure, and the claims of the patentee.

A piece of plank, four inches wide and three feet long, is fastened against the wall of a room. Towards one end of this is affixed an iron axis, or pin, upon which turns a wheel exactly like that of the common wheel for spinning yarn. A band from this wheel turns a whorl, which revolves upon another iron pin near the opposite end of the plank. If six spindles are to be used, there are to be upon this whorl six grooves, besides that upon which the band of the large wheel passes. Upon a frame above the whorl, there are six spindles with whorls; one band passes round all these, and the grooves of the long whorl, and, of course, its tension is the same on all.

A carriage, or brake, to hold the rolls, is suspended to the frame, but is neither well described or figured. It has a forked wire fastened to it, to serve as a handle by which to work it. There is a single large spindle standing alone, just above the long whorl; its use we do not perceive, excepting it is occasionally to be used alone, when it becomes a common spinning wheel fastened to a wall. What is claimed is as follows:

"1st. The right of constructing the woollen wheel against the wall, or side of the house."

"2nd. The right to construct the single and double geared head together, as above described."

"3d. The right to run spindles on round rails, with leather stretched round to hold the collars, so that the points will run steady."

"4th. The right to run a single band on the short grooved whorl, with any number of spindles above one, so that they may all twist at all times alike."

"5th. The right to make a brake with the jaws at the bottom, with the forked wire guide and hinges."

"6th. The right to apply the head, by means of boards and a whorl, as before described, to the common wheel now in use, thereby giving it greater velocity and ease of application, with much less expense than any machine now in use."

15. For an improvement in the mode of *Hanging Forge Hammers*, for the manufacture of bar iron, called the Clam Boit; Jonathan M'Neal, Colerain, Lancaster county, Pennsylvania, January 21.

The specification states, that "the boit formerly used was of cast-iron, about twelve or fourteen inches long, and four inches square, with one, two, or three, indentations for the pivot of the husk to work in: it was fitted into the leg lengthwise, even with the surface, being immoveable, or nearly so. The improved boit is of cast-iron, from twelve to sixteen inches long, ten to fourteen inches wide, and two inches thick, with clams, or flanches, on the ends, about one and a half inches deep. It is fitted into the leg, even with the surface, the flanches being on each side, sufficient room being left to raise and lower it at pleasure by keys; also room for keys between the flanches and the leg to fasten the boit, and to regulate the hammer so as to strike fair on the anvil."

"In the centre of the boit, there is a square hole, about four inches on the side next the husk, and three on the opposite side, in which a cast or wrought iron nut is inserted, with an indentation for the pivot of the husk to work in. This nut when worn, may be removed, and a new one substituted without renewing the boit."

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16. For a *Conical Steel Grist Mill*, to run vertically, principally for grinding Indian corn into grist or meal; Thomas Baker, Sumter district, near Statesburg, South Carolina, Jan. 21.

There is nothing particularly striking in this mill, by which to distinguish it from others which have been previously constructed and extensively used; the most celebrated of these, is that which was much used in the French army, and is well known to those conversant with the history of mechanical science. The present specification does not designate the points which are claimed, but merely describes the whole machine.

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17. For an improvement upon Levi Jacobs' *Razor Strap*, or strop; J. W. Osborn, Terre Haute, Vigo county, Indiana, January 21.

Agreeably to our rule, we shall not give the recipe contained in this specification, but merely say that it is only another version, in addition to its thousand predecessors, of a mode of using leather, emery, and crocus, with certain ingredients to form the two latter into a paste, and that, like them, it will be good or bad according to the care with which it is prepared.

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18. For a machine for *Hulling or Husking Cotton Seed*; Francis Follet, Petersburg, Virginia, January 21.

The seeds of cotton contain a very large portion of oil, of a quality which adapts it to various useful purposes. In pressing this seed with the husk, or hull, upon it, a considerable portion of this

oil is lost, in consequence of its absorption by the fibres of cotton which remain upon the hull after the ginning process is completed. A facile mode of removing this hull is, therefore, a desideratum. The quantity of cotton seed which is annually wasted, might, if collected, be made to produce many thousand tons of oil; the end proposed to be accomplished is, consequently, one of national importance.

This machine consists of a cylinder formed of stone of a rough grit, or of any other material to which a rough surface may be given by artificial means. This cylinder runs within a concave segment, placed at such distance from it as just to allow the seed to be hulled to pass between them, in doing which it is subjected to a double action from the revolution of the cylinder and a sliding action given to the concave segment. There is a sifter and other appendages, to separate the hull from the kernel. We are informed that the machine fulfils the expectations of the inventor, so far as its action is concerned, and requires only to be fully known to prove its great utility.

The claim is, "the adaptation of the cylinder, and concave part, as to the construction, or form, and face, or working surface, and set, and the mode of feeding, and the mode of sifting and separating the grosser part of the hull or husk of the cotton seed from the kernel."

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19. For a *Compound Lever Press*, adapted to the pressing of cotton, tobacco, paper, and many other purposes; John Rodgers, Maury county, Tennessee, January 21.

This is in fact a rack and pinion press. The follower is a rack, sliding through the cap timbers of the frame, and attached below to the follower block, under which the articles to be pressed are placed. The pinion is on the shaft of a rag wheel; this rag wheel is acted upon by means of a vertical lever, having a click which falls into the notches upon its periphery, with a second pall, or click, to hold it as the feed is given by the first. The vertical lever receives a vibratory motion from a crank on the shaft of a wheel or wallower, driven by any convenient power.

Claim not specified.

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20. For an apparatus to be used for the *Cure of Inflected Spine* in the human body, called the Dormant Balance; James K. Casey, New York. First patented June 23d, 1823. Patent surrendered in consequence of a defective specification, and reissued January 21.

We published the first specification with a wood cut, and have a plate now engraving for the second, which will shortly appear.

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21. For making or manufacturing of *Blanks for Checks*, or drafts, or bills of exchange, or other such like instruments; James Atwater, New Haven, Connecticut, January 21.

We have already noticed this invention in a former number of this Journal, having extracted from Silliman's Journal an article written upon the subject, by that gentleman. The details of the method would occupy much space, and ought not to be given without the approbation of the patentee. The claim of the inventor, is in the following words.

"The said inventor does not claim an exclusive right to make and sell such blank instruments as are now in use, whether of the common form, or containing upon them any ornamental margin, or work, or the name of the drawer, and whether printed from types, or plates, with common, or vegetable, or other inks. But he does claim as his invention, the foregoing improvements upon all such instruments as are now in use, and whether printed from types or plates."

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22. For an improvement in *Spinning*, called a "Cap Spinner," being an improvement on the "Ring Groove Spinner;" John Thorp, Providence, Rhode Island, January 23.

This will be noticed, together with several other improvements in spinning, recently patented by the same gentleman.

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23. For a mode of *Straightening and Soldering Drums or Cylinders*, such as are used in cotton and woollen factories; Luke N. Perry, Worcester, Massachusetts, January 23.

A strong bench is made of such length as may be necessary for the longest drums. This bench is to be perfectly straight; at its back edge a ledge is formed by fastening on a straight solid piece of stuff, rising nearly to the height of the diameter of the drums; a second ledge is prepared, which may be secured upon the bench, at any required distance, so as to form a trough or gutter to contain the separate pieces which are to be soldered to form the drum; a third piece of stuff is hinged to the top edge of the back ledge, so as to rise and fall like the lid of a box. Across the bench, and each of the pieces forming the trough, grooves are cut, to the depth of about half an inch, exactly where the joinings of the sections of the drum take place.

When the cylinders formed by the individual pieces of tin, or other metal, have been made, they are slipped into each other, like the joints of a stove pipe; they are then placed in the angle against the back ledge of the bench; the front ledge is forced up and secured, and the moveable piece, called the press beam, is brought down and secured by proper catches. This press beam laps upon the cylinder, or drum, no further than is necessary to confine and keep it straight, so that a portion of its periphery, say one-fifth, is left uncovered; the joints are then soldered for that distance, when the strips are loosened, the drum turned, and again secured; then all the parts are successively united, when the whole must, necessarily, be perfectly straight. Provision is made, at one end of the table, for securing and soldering pieces, the lengths of which may differ from that ordinarily employed.

24. For a *Churn*, called the "Forcing Valve Piston Churn;" Benjamin Cushwa, Clear Spring, Washington county, Maryland, January 24.

This churn stands like the common churn, and may be made of an oval form. It is divided into two chambers, by a partition, which may reach within a small distance of the bottom. Two dashers are made to fit as closely as possible into these chambers; the piece which forms the partition is allowed to project above the top of the churn, to support a lever of two arms, working on a centre pin, through a mortise in this partition. To this lever, the handles or rods of the dashers are connected, so as, alternately, to work up and down. There is a valve in the centre of each dasher, opening downwards, in order to allow the cream which passes the edges of the dashers, to find its way below them, in their ascent.

In working the lever, the cream is forced backward and forward under the partition, or through holes near the bottom of it. The claims are,

"1st. The communication between the two chambers, or the small holes (or openings) at the lower part of the division."

"2nd. The manner of attaching the lever to, or on, the top part of the division, or middle part of the churn."

"3d. The principle of forcing the cream to and fro, from one chamber to the other, through the small holes (or under) in the division, or middle piece, by the application of the valve piston, together with the manner of making and applying a valve on the piston of the churn."

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25. For a machine for the *Planting of Corn*, called the 'Farmer's Assistant;' Matthew Lennox, William Croft, and Henry Pitner, Steubenville, Jefferson county, Ohio, January 26.

A carriage is framed together; this runs upon two wheels, connected together by a roller of such length as to allow of the planting of two rows of corn at the same time. The circumference of the wheels is equal to twice the distance at which the corn is to be planted. There are two hoppers, over the cylinder within the wheels, to contain the corn, with two cups, holding the number of grains intended to be dropped, there being two droppings in each revolution of the wheel. Two colters open the ground to receive the seed, and two small harrows follow to cover it over.

The specification does not make known the particular points claimed, nor does it give a clear exposition of the exact structure of some important parts; it commits a fault common to a great number of those which are sent to the Patent Office, in giving precise dimensions for parts in which size is of little consequence, and in these minute details obscure the essential features of the things intended to be made known.

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26. For a machine for *Cutting Sausage Meat;* Elias Wade, Elizabethtown, New Jersey, January 26.

A shaft with two cranks is turned by a wheel and pinion. These cranks work two cutters, which rise and fall in guides. A circular tub, or trough, beneath the cutters, contains the meat to be cut; this revolves upon friction rollers, having motion communicated by means of whorls and bands from the crank shaft. There are scrapers borne against the sides of the cutters by springs, serving to clear the meat from their edges.

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27. For a machine for the manufacture of *Shoe Pegs;* Silas Beckwith, Silas Beckwith, jr. and Eleazer Beckwith, Westmoreland, Oneida county, New York, January 27.

A sliding gate works in grooves, on two uprights; at the bottom of the gate is a cutter, or knife, to split the block into strips, there being a contrivance to regulate their thickness. The strips are held in a clamp, and a plane with two irons forms them into long wedges; these are afterwards split into pegs, which, of course, are bevelled on two sides only.

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28. For an improvement in the manufacture of *Forks*, with four or more tines, commonly called spring tempered, or patent forks, or pitchforks, used for manure, bark and other purposes; Calvin Perkins, Waterbury, New Haven county, Connecticut, January 27.

This specification refers to two other patents which have been obtained for similar purposes, upon which it claims to be an improvement. The details of the manipulations in forging the fork, are minute. The principal points, however, appear to be the welding of a piece of iron into the centre of the steel bar from which the fork is to be formed; this piece of iron forms the shank which passes into the handle, and being of iron, does not harden when it is heated and suddenly cooled in fixing it; and the particular mode of slitting and drawing out the steel bar, at each end, according to the number of tines required; as will appear from the claim.

"What I claim as my improvement, is, the fastening, or welding the piece of iron to the bar of steel, for a shank, and the improved method of preparing the bar of steel by means of fastening on the shank, and swedging down the bar of steel on each side of the shank, so that the tines are easily and cheaply drawn out."

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29. For an improvement in constructing *Screw Docks* for raising vessels to be repaired; John C. Ely, New York, January 28.

A dock is prepared, into which the vessel to be raised is to be floated. A frame work of strong timber, supported by posts, is erected in a way particularly described in the specification. Screws of iron, or other suitable material, of 20 feet in length, for a vessel of 500 tons, are passed in two rows through these timbers, and work in metal boxes in the ends of cross timbers, placed under the water. In

the dock described, there are 32 screws, forming two rows, 16 at each side of the dock, acting upon 16 cross timbers, or sections, placed at equal distances from each other. The vessel floats into the dock, above these sections; the screws are then turned so as to make them bear against the keel, and the vessel secured by proper shores, blocks, or bilge wedges.

By means of chains, wheels, and pinions, geared into their heads, or nuts, the screws are turned with greater or less power, according to the resistance to be overcome, and their motion is facilitated by the aid of friction rollers. When the vessel is ready to be raised, men are placed at each screw, that every part may bear the same strain.

To lessen the strain upon the screws, chains are sometimes to be attached to each end of the sections, and made to pass over pulleys above, so that counter weights of from 5 to 15 tons may be suspended to them.

A floor of plank is to be laid from section to section, to make a platform for the workmen.

The claim is for the "method of applying the screws, whereby the sections are suspended upon the screws, and are not forced up by the screws having a firm rest or bearing under the water, upon which they rest. The application of weights to the raising of vessels in a screw dock, as above described, acting in combination with the screws." A particular arrangement for applying it to steam boats, with their guards, and all their machinery. And the "combination of wheels, chains, and gearing, so as to enable a man, by one continued motion in a circle round the wheel on which the lever is placed, to raise up the screw to which the gearing is attached."

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30. For machinery for *Cutting Wafers, and Leather for Gloves, &c. &c.;* Elisha Mills Ely, formerly of New York, but now of Paris, in the kingdom of France, January 28.

The contrivance explained in the specification of this patent is merely the placing of sharp cutters upon a table, or platform, then laying the article to be cut, as sheets for wafers, leather, &c. upon these, and passing a roller or rollers over it, so as to make sufficient pressure; or otherwise, to draw the table or platform under the rollers; the pressure of the rollers being regulated by springs.

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31. For a machine for *Breaking Sugar,* denominated the 'Sugar Break;' Woolsey G. Sterling, Bridgeport, Fairfield county, Connecticut, January 28.

A cylinder about four inches in diameter, has four rows of knives set along it, spirally, at the distance of about half an inch apart; this cylinder is made to revolve, horizontally, by means of a crank. A row of similar knives affixed to a piece of timber, and projecting out about three inches, is placed across a trough on one side of the cylinder, the revolving knives of which pass between those upon the fixed timber. The sugar to be broken is placed upon an inclined

board, and drawn down so as to be acted upon by the knives, between which it falls, and is collected underneath.

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32. For improved *Canal and other Boats*, for propelling, steering, and preventing the rolling of the waters, and the washing away the banks of canals, &c.; Samuel D. Bennet, Butternuts, Otsego county, New York, January 30.

The boat described is to be driven by steam; there are two water wheels, the buckets of which are made in the form of scoops, the more perfectly to take hold of the water. The propelling wheels are fixed within a race, towards the stern of the boat, the sides of which project below the buckets, to still the agitation caused by them. The boat is to be steered by the bow as well as by the stern; for this purpose a wheel, formed like a half globe, with buckets, stands across the bow, and receives a motion in either direction by a long shaft extending along to it from the after part.

We deem it unnecessary to describe it further, as these are the novelties claimed.

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33. For *Cooking Furnaces* and Ovens; Leonidas V. Badger, Dover, Strafford county, New Hampshire, January 30.

The furnace is of cast or wrought iron. The oven is a cover, which may be variously formed, and is to be placed over the furnace, with proper contrivances for containing the articles to be boiled, baked or roasted. The whole structure is explained, but a particular description would require drawings, which we think the subject does not demand.

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34. For a mode of *Spinning Yarn* from sheep's wool, called the 'Canton woollen bobbin and flyer;' William B. Taber, Canton, Norfolk county, Massachusetts, January 30.

The mode of spinning above referred to, is by means of a fixed spindle, with a revolving bobbin, driven by a band, and worked up and down by a lever, or cam, to distribute the yarn. Upon the top of the spindle there is placed a metallic cone, the lower edge of which serves to distribute the yarn upon the bobbin, as it rises and falls within the cone. The twisting of the yarn is effected by the revolution of the bobbin. We shall, probably, hereafter give the whole specification with illustrations.

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35. For elastic *Water proof and air proof cement*, paint, or varnish; John J. Howe, New York, January 31.

We have seen specimens of the articles prepared by Mr. Howe's process, which appeared fully to justify the character indicated by the title of the patent. The process, involving the publication of a recipe, we omit.

36. For an improvement in making or *Manufacturing of Cider*, being a combination of machinery, called the 'Portable horse power cider-mill and presses;' Uri Emmons, New York, January 31.

This is a cider mill and presses, intended to be removed with facility from place to place. In its general appearance it bears some resemblance to the ordinary fire engine. A vertical shaft rising from the centre, is worked by horse power, a sweep being put on for that purpose. There is a hopper in which to put the apples, with fluted rollers below, by which they are ground; a chamber, closed by a spring, to receive and retain stones, or other hard substances, which may, by accident, be mixed with the apples. The presses are formed by the lower box, each end of which is a chamber to receive the pommage; two screws, placed horizontally, are forced forward into these chambers, by gearing from the horizontal shaft; by these the pressure is made, and the cider allowed to run out from the chambers at proper openings.

"Now, what the above named Uri Emmons claims as his improvement, and for which he solicits a patent, is, 1st, the combination and peculiar construction of the several parts, combining one part so as to form another part. 2nd. The principle of the chambers for receiving hard substances. 3d. The horizontal double geared screws for presses, (horizontal or perpendicular.) 4th. The forming and constructing the apparatus so as to be a portable machine, yet possessing the advantages and conveniences required for making cider, so that it can be used any where, without being in, or attached to, a building. The stone chamber and doubled geared screws I claim, whether attached to this or any other cider-mill press."

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37. For an improved *Grist Mill*, or mill for grinding grain of every kind into flour, or meal; or for grinding plaster stone into fine plaster; Benjamin M. Kemp, Fort Plain, Montgomery county, New York, January 31.

The moving stone in this mill may be either a cone or a cylinder, the axis of which is to stand vertically, and may vary in size, according to the power applied, or work to be done. The fixed stone, which is to stand upon a bed of solid timber, may be in a single piece when the runner is conical, as the feed is thin, regulated by raising or lowering the running stone. When this is a cylinder, the outer stone may be in two or more pieces, surrounded with iron bands, through which screws may pass to force up the different sections. The stones are to be furrowed in the usual manner. When the mill is constructed for shelling corn, it may be made in the form described; but the body may be of wood instead of stone, and the furrows made by nailing or screwing on strips of iron.

The claim of the patentee is not specified, although some of the advantages which he thinks this mill offers, are stated by him. Conical mills, patented and unpatented, of stone and iron, have been repeatedly made; the claim intended to be established cannot, therefore,

be to the form, as indeed the including a cylinder in the description would sufficiently indicate; nor can it be to the division of the outer stone into sections, as this appears to be adopted with the cylinder only.

It may fairly be made a question whether two distinct machines are not described in the specification; namely, a mill, of stone, for grinding different materials, and a machine for shelling corn, which machine is made of wood and iron.

SPECIFICATIONS OF AMERICAN PATENTS.

Abstract of the Specification of a patent for a Thrashing Machine. Granted to James S. Wood, *Pattonsburg, Botetourt county, Virginia, January* 9.

The thrashing part of the machine is composed of a cylinder, and a curve, in which the cylinder revolves. The cylinder is 5 feet long and 21 inches in diameter. Strips of hoop iron are nailed lengthwise upon the cylinder, so as to cover its whole surface, the edge of one lapping upon another, and thus forming a series of ridges or furrows all around it. Four rows of projecting iron points are affixed in the cylinder, to serve as feeders, to force the straw between the cylinder and the curve; these stand out about three-quarters of an inch above the surface of the cylinder. The curve is a piece of timber, hollowed out to suit the roller: it is placed in front of it, its hollowed part extending in width about 9 inches, from a little below the centre, to the upper part of the roller, and above it rises a piece of plank to conduct the straw into the hollowed part. The curve is covered with strips of iron, in the same manner as the roller, there being vertical grooves in it to allow the projecting feeders of the cylinder to pass it in their revolution.

The distance between the curve and the cylinder is about $\frac{3}{16}$ of an inch. The cylinder is made to revolve about 220 times in a minute, by any proper means. The wheat, or other grain, to be thrashed, is laid lengthwise of the roller, between it and the guide piece, and is carried down by the feeders. Two persons are employed in feeding, the cylinder being long enough to take in two lengths of the straw. There is no feeding apron, the sheaves being unbound, and laid upon an inclined platform just above, and back of the cylinder, whence it is taken by hand.

The gudgeons of the roller work in sliding timbers, which admits of the space between it and the curve being changed, according to the nature of the grain to be thrashed. The mode of doing this may be varied, and is not claimed, the thrashing part being all that is considered as new. The specification concludes thus:

"The following is intended as a view of the features of this machine, designating it from all other inventions of the same kind."

"This machine differs from all others that thrash by means of a

cylinder and curve, viz. in the first place, in the mode in which it forces the straw through the space between the cylinder and curve, by means of the feeders; thereby rendering it impossible for the straw to clog up in the space, and choke the machine, which is a disadvantage attendant on all other machines working with a cylinder and curve."

"Secondly, it differs in this, that the straw is, by means of the feeders, confined to that part of the surface of the cylinder on which it first falls, and is forced through the space between the cylinder and curve, with the same velocity that the surface of the cylinder moves; whereas, in other machines, working with a cylinder and curve, the straw is not forced through the said space with any thing like the same velocity that the surface of the cylinder runs, but remains awhile in the curve while the cylinder glides, or runs, upon it. The advantage arising from the straw being confined to the surface of the cylinder is considered to be this, that the impulse, or shock, given to heads of the grain on their being dragged through the said space by the feeders (with equal velocity with the cylinder) is much greater than when the cylinder glides or runs upon the straw, and requires little more than half the velocity in the cylinder that is required on the other plan, and a consequent proportional diminution of the power necessary to apply to the machine when thrashing; as is proven in the fact, that one horse of ordinary strength is able in this machine to thrash out 100 bushels of wheat in a day, provided the wheat is sufficiently good to yield a bushel to two dozen, and with this power from seven to eight sheaves can be thrashed in a minute.

A third property of this machine, distinguishing it from others, relates to the mode in which it gets out the grain, viz. the straw being confined by the feeders to the surface of the cylinder, as before stated, the instant it falls on its surface, the head of the grain is severely lashed against the said piece of timber placed on the top of the curve; and whatever may remain in the head is rubbed off, by the furrows in the curve, in its passage through the space between the cylinder and the curve. The curve, therefore, of this machine is more effective in thrashing or rubbing out the grain than the cylinder; whereas, in the other machines alluded to, the cylinder is most effective, as its surface runs on the heads of the grain, and its furrows rub it out while the heads of the grain remain for awhile in the curve.

JAMES S. WOOD.

Specification of a patent for an improvement in the Mill for Grinding Apples. Granted to DAVID D. DEMAREST, *New Milford, Orange county, New York, January* 14, 1829.

A PAIR of stones is put in operation (by water, or any other convenient power,) somewhat similar to those of a grist mill, except that the lower stone is the runner, instead of the upper one, and

the face of the upper stone is concave, and the lower one convex, that they may clear themselves of the pummage the more readily, and thereby facilitate the grinding. The acclivity of the face of the convex stone forms an angle with the horizon, of about thirty degrees; the concavity in the face of the upper stone, is sufficiently greater than the convexity of the lower one, to admit an apple of the largest size between them at the eye, while they operate closely enough at the outer edge, or periphery, of the stone, to grind the apples to the required fineness. The eye of the upper stone, into which the apples feed, is twelve or fifteen inches in diameter; the hopper is placed directly over it, and the apples, by their gravity, are forced into the eye of the stone. By the motion of the lower stone, aided by the dress and the surfaces, each regularly descending from the eye to the periphery, the apples are passed rapidly through between them, and ground in a very superior manner. The pummage passes out freely on all sides, and falls into a vat beneath. A dress is given to the stones similar to grist mill stones, only rather deeper. Circular pieces of cast-iron, properly shaped as before described, or blocks of wood faced with cast-iron, or rods of wrought iron firmly bolted on the face of the said blocks, so as to give them the appearance and effect of dress, may be used instead of stones. The stones may be more or less concave or convex, as it may be desired to have the apples more or less rapidly passed through the mill. The diameter and dimensions of the stones may be varied to suit convenience, and the power intended to be applied. Less power is required to propel the mill when grinding apples than when grinding grain.

DAVID D. DEMAREST.

Specification of a patent for a machine for the Cleaning of Paper Rags, by which great expense and labour are saved. Granted to WILLIAM DEBIT, *East Hartford, Connecticut, January* 13, 1829.

ATTACH several knives horizontally to the ribs of the screen, or duster, which may be varied in number, length, and width, according to the size of the screen, or duster. The screen, or duster, then revolves in the common way, by water or other power, on hollow axles. In addition to this, an iron shaft passes through the centre of the screen, or duster, and hollow axles; this shaft has a number of knives inserted in it, which are secured by wedges, or nuts, and revolves in a contrary direction to the screen, or duster. Twelve knives in the iron shaft, and six knives on the ribs, I have found well adapted to accomplish the object; with a revolution of the screen, or duster, from 15 to 20 times a minute, and of the iron shaft, from 40 to 50 times a minute, but the exact number of either is not thought to be material. The drawing deposited in the patent office, will show the improvements, as well as the external form of the screen, or duster. The latter, of course, is not claimed as my in-

vention. By my improvement, there is effected a great saving of labour in the cleaning of rags, and preparing them for use in the manufacture of paper. WILLIAM DEBIT.

Remarks on an article in the Journal of the Franklin Institute for February last, on Fulminating Powders, and their use in Fire Arms. By JOSHUA SHAW, ESQ.

TO THE EDITOR.

SIR,—I am induced, from reading an article in the Journal of the Franklin Institute, on the subject of certain fulminating powders, written by Lieut. P. Schmidt, of the Prussian service, to send you some remarks, which are the result of much experience upon the point in question. I hope, however, that you will not expect from an operative artist, any thing which is very systematic or scientific, for in this case you will be disappointed, as I am equally far from possessing either the ability or the inclination to furnish it. To me, and to many more practical men, the learning which writers appear anxious to evince, seems to predominate over every thing else, and thus to destroy the utility of their labours. It is in vain to attempt to give instruction, excepting a language be used with which the pupil is in some degree familiar.

In the paper to which I have alluded, Lieut. Schmidt, in speaking of the powder made from oxymuriate of potash, sulphur, and charcoal, observes, that it is made by adding together twelve parts of sulphur, ten of charcoal, and one hundred of the oxymuriate, and then proceeds to give the result of his experiments. My object at present, is, not to treat of the best mode of preparing the different fulminating powders, but rather to correct the false statements which are made respecting the utility of the different kinds. I will observe, however, that from long experience, I can aver that the proportions above given are not such as will produce the strongest powder from these materials.

It is perfectly clear to me, that at the time the Lieutenant wrote, the subject was new to him, and, indeed, he speaks of the recent use of the copper caps in Germany. I have been in the habit of using copper caps for at least thirteen years, and for the last seven years have manufactured and sold them, at the rate of two millions annually. After speaking of various contrivances, he says, "besides these, other devices have been used for the purpose of igniting this kind of powder, yet they have all their defects, and offer so many difficulties in practice, as to have prevented their general introduction." It would then appear that we are, in this respect, much in advance of Germany, as we have had the prepared caps in almost universal use, for many years, and have never met with the difficulties complained of; this may have arisen, in a great degree, from our having fewer prejudices to contend with than the inhabitants of that country.

Lieut. Schmidt alludes to the observations of Mr. Wright, of

London, on the use of fulminating mercury, mentions his mode of filling the caps with this material, by means of an ivory rod, to which he objects as being both laborious and dangerous; he then recommends a plan of his own, as being much more safe and expeditious. Although this may be a subject of serious discussion between England and Germany, it must here create a smile only. The Lieutenant speaks of filling several thousands in *a week;* by means of an apparatus which I have invented, and long had in use, a little girl fills several thousand in the course of a few hours, every morning. In about four seconds, 500 of the caps are collected together and arranged for filling, and in about the same time an equal quantity of the powder is deposited in each; it is then, with great rapidity, secured by a cement which renders it impervious to water.

It is said that difficulties have been experienced in England, in igniting gunpowder, by the fulminating mercury, and it appears that the labours of the German professors upon this subject, have resulted in their drawing conclusions altogether erroneous respecting the kind of fulminating powder which should be used in fire-arms. Fulminating silver may be considered as out of the question, on account of its price, and need not, therefore, be further noticed. With respect to that prepared with the oxymuriate, its destructive effects are such, as to forbid its use entirely. It soon rusts the lock, penetrates the pores of the iron, rendering it carious, and, consequently, liable to burst. We have long since abandoned the use of it altogether, and are not likely to resume it, in deference either to English or German opinions.

It is plain that Lieut. Schmidt mistakes the meaning of the word *effect*, as used by Mr. Wright. The fulminating quicksilver makes a louder report than the ordinary fulminating powder, but will not fire the magazine at so great a distance. Its fire is rapid, but not elastic, or expansive, as it quickly condenses, and returns to the state of mercury: it is, however, certain, and presents no difficulties whatever.

The most extraordinary part of the statement is, that the fulminating quicksilver is more corrosive than the oxymuriate preparation! With what difficulty do we sometimes arrive at the most simple truths. Nothing can be more gratuitous and false than the above conclusion. Mr. Forsyth of England expended, it is said, a hundred thousand pounds in his attempts to establish the use of the percussion magazine lock, in which he failed altogether, from the corrosive effects of the powder; the whole 14 years of his patent were devoted to this point. As soon as this period had terminated, Mr. Wright introduced the fulminating mercury, since which there has been no complaint whatever of the corrosion of locks and barrels, excepting from the use of imported caps, charged with the old materials.

The cement used, is a point of much importance; gum benjamin and gum arabic, have been principally employed; the first is always soft, the latter attracts moisture; neither of them answers well. The French, to obviate the defects of both these, sought the remedy by

enlarging the caps at the bottom, so that when the powder is introduced and dry, it is, as it were, dove-tailed in, and a smaller quantity of either of the foregoing ingredients will retain it. This lessened, but did not remove the evil.

In America, the percussion gun has, in consequence of the manner in which the caps have been made here, been more generally employed than in England, although the guns themselves are the manufacture of that country. We have, it is true, ran counter to the rules established by the German officer and professors; for, although we may be less scientific in these matters, we know enough of the amusements of the field, to derive from our experience that information which suits us better than the most learned theories, and we even venture to adopt the suggestions of the former, although opposed by the deductions from the latter.

Should you think proper, sir, to give this a place in your Journal, I shall again request a small place for some future observations, containing the practical results of my own experience, as it may interest a certain portion of your readers.

Yours, &c.

JOSHUA SHAW.

Philadelphia, March 20, 1829.

Remarks by the Editor.—We are glad that Mr. Shaw proposes to make some additions to the foregoing, as without such an intention we should not think the subject usefully handled as regards the public. What has been given, we are disposed to consider merely as a preface to what is to follow, and under this impression we have willingly inserted it. Mr. Shaw has told us that the recipe of Lieutenant Schmidt for the fulminating powder is not the best; that the modes of filling caps previously pursued, are inferior to his; that he has a more perfect cement than any which has been heretofore used, &c. &c.; all of which we are prepared to believe, and do indeed admit as a fact, and we hope that his next paper will be one of recipes and processes. We know that Mr. Shaw is able to communicate much useful information, and we presume that his next paper will justify this judgment in the opinion of our readers.

ENGLISH PATENTS.

To WILLIAM HALL, *Merchant, for his invention of certain improvements in Machinery, or Apparatus, for Propelling Vessels.* Enrolled June, 1827.

THE object of the patentee, is, to dispense with the ordinary paddles employed for propelling vessels, and, indeed, of all machinery or apparatus applied on the outside of the vessel for the purpose of rowing or driving the vessel forward, by the mechanical force ex-

erted by paddles or oars against the water; to substitute in place of such contrivances, a jet or volume of water, driven out with force in a horizontal direction at the stern, the reaction of which against the water shall produce the impelling effect required, and drive the vessel in the opposite direction.

In the lowest part of the vessel below the water line, a cylinder is placed vertically, which is open at the lower end to admit water into it through an aperture in the bottom of the vessel, but having a grating to exclude weeds, or any other floating substances. The top of this cylinder is closed with a cap, and rendered perfectly air-tight. Within the cylinder there is a large screw placed vertically, the edges of the worm of which nearly touch the periphery of the cylinder. The screw is intended to revolve upon its axis, or upon pivots at top and bottom, and acting in the way of an Archimedes pump, to raise and force the water through the horizontal tube above-mentioned, which leads from the upper part of the cylinder.

The screw pump is made to revolve with great rapidity by a rigger affixed to the upper end of its axle, which is driven by a band, leading from a steam engine. A jet or volume of water is, by these means, projected with great force from the stern of the vessel, and by striking against the surrounding mass of fluid, in which the vessel floats, causes the vessel to be propelled forward, that is, in the opposite direction to the jet.

It is proposed, under some circumstances, to employ reciprocating pumps to be driven by the steam engine within, which shall raise a volume of water from the bottom, and force it out at the stern.

The attempt to propel vessels by the force of a jet of water driven from the stern, is not new; various modes of effecting this have been devised. Mr. Stedman Adams, of America, in 1811, obtained a patent for such a contrivance; and in 1820, Messrs. Lilley and Fraser obtained a patent for the same object (see the second volume of our first series, page 101.) If there is any novelty in the present plan, it is the introduction of the screw pump in a vertical position, for raising or forcing the water; although paddles of this form have been applied horizontally on the outsides of vessels. There is, however, no question but that the power expended in this way to raise the water, will have a considerable less beneficial effect than if applied directly to the working of paddles. [*Lond. Journ.*

To James Gilbertson, *Grocer, for his having invented an improvement, or improvements, in the construction of Furnaces, by which they consume their own Smoke.* Enrolled March, 1828.

The patentee says, that his invention "consists in the construction of furnaces, with their sides made of hollow plates of iron, in order that a current of air may pass through them, and in its course become heated, and then be discharged into a cavity or ash-pit,

formed at the back of the fire, whence, proceeding through a grating affixed at top of this cavity, it comes in contact with the smoke and flame of the fire, and causes an almost complete combustion of the whole of the fuel employed.

"In large furnaces, where a great quantity of air is necessary, I make a portion or the whole of the bars hollow; but I do not claim any invention in this application of hollow bars, only as in aid of the effect to be produced by the hollow plates at the side."

It is further stated, that the patentee does not intend to confine himself to any particular form of furnace, as it is evident various modifications may be requisite in adapting it under different circumstances. It appears, therefore, that the invention, to whatever form of furnace it may be applied, consists merely in making two hollow spaces on the sides, for the passage of the air to the back part of the fire, or through hollow bars to the same part of the furnace, for the purpose of directing a small current of air in such a way at the back part of the furnace, as to cause the flame and other heated vapours, to be driven back into the ignited fuel, in order that it may be consumed.

There being no particular novel feature or form of furnace claimed, we are at a loss to discover in what this invention consists, as the contrivance of consuming the smoke of a furnace, by conducting a current of air into the flue, beyond the fire, which shall drive back the flame and smoke into the ignited fuel, has been repeatedly applied for the same purpose, and with good effect; under certain modifications, it forms the subjects of several patents, (see our first series,) Bunton's Patent, Vol. I. page 407; Johnson's, Vol. II. page 440; and, if we mistake not, was first applied by Mr. Sheffield, in 1812. [*Ib.*

To John Meaden, *Coach Maker, for his invention of certain improvements on Wheels for Carriages.* Enrolled June, 1828.

The patentee considers that there would be an advantage in the running of carriage wheels, if their peripheries, that is, their felloes and tires, were made half round on the edge, instead of flat or bevelled, as is the common practice. The improvements herein proposed, therefore, consist in forming the tire, or iron hoop, which embraces the periphery of the wheel, with a convex surface on the outside; it may be semicylindrical, or curved in a smaller degree, as shall be thought most desirable.

The proposed mode of making the tire, is, by passing bars of iron in a heated state between rollers; the one roller having a hollow groove cut round it, and the other, a corresponding bead or rib. The bar being by these means rendered hollow on one side, and rounded on the other, is ready to be bent into a hoop or ring, for covering the periphery of the wheel. A suitable length of bar iron thus prepared, is now to be bent into the form of a hoop, and welded

together; after which, it is placed upon a conical block, and hammered to its true circular form.

The wooden part of the wheel being made, and the periphery or felloes finished to the true circular form, the tire, or iron ring, is uniformly heated all round, which causes it to expand sufficiently to be passed over the wooden rim or felloes, and when this is properly effected, the wheel is lowered into a vessel or pool of water, for the purpose of cooling the iron, and causing it to shrink, which binds it fast to the wheel.

All this, however, is the ordinary process employed in placing an iron tire upon a wooden wheel, and the only feature of novelty claimed, is the rounded form of the tire, which, it is thought by the patentee, will be found greatly preferable to the flat bar iron, with which carriage wheels have been heretofore shod. [*Ib.*

To JOSHUA JENOUR, JR., *Gentleman, for a Cartridge, or Case, and method of more advantageously enclosing therein Shot or other Missiles, for the purpose of loading Fire-arms and Guns of different descriptions.* Dated November 28, 1827.

MR. JENOUR'S cartridge, or cartouch, is composed of wire netting, the meshes of which, as represented in the drawing to which the specification refers, are about a quarter of an inch across. It must, of course, be made of a size proper for fitting the barrel of the fire-arm, with which it is to be used, and long enough to contain the usual charge of shot.

This cartouch may be employed in two different modes. In the first, it is to be enclosed in a case of thin paper, with wadding placed at each of its ends, ready for being inserted into the barrel of the fire-arm; and in the second method, it is to be dropped into the barrel, immediately after the charge of powder and its wadding are rammed down. The proper quantity of shot is then to be poured into it, and a second wadding over all will complete the operation.

The intention of this wire cartouch, is, to cause the shot to keep closer together after the discharge, and at the same time to leave spaces between the meshes for its passage in its ultimate dispersion.

The patentee states that the finer the meshes of the wire net are, the closer will the shot be kept together; and that fine sand, or other hard powder, put in between the interstices of the shot, will increase its effect.

OBS.—We are inclined to think Mr. Jenour's wire cartouch preferable to that for which he obtained a premium of fifteen guineas, a few months ago, from the Society for the Encouragement of Arts, an account of which is inserted in our fifth volume, p. 233, present series, where several experiments are related, that prove the advantages of the method, and which are also applicable to the present cartouch. We also think this latter cartouch will occasion less

trouble in its application, and may be managed with considerably more facility than the former.

A third method of using the wire cartouch occurs to us, that in some respects seems preferable to the other two already mentioned, which is, to put the thin paper case *inside* the wire cartouch, an arrangement that probably would cause the shot to be less dispersed by the discharge, than if the paper case were placed outside, as directed in the other method.

The word cartridge used in the specification being evidently a corruption of the French, *cartouche*, (that is, derived from *carton*, the stiff paper, or thin card, of which the article is usually made,) it appears to us, that of the two English words employed for it, cartouch is the most legitimate. [*Rep. Pat. Inven.*

To RENE FLORENTINE JENAR, *Gentleman, for his invention of a new method of filling up with Metal, or other suitable material, the Holes or Interstices in Wire Gauze, or other similar substances, which he denominates Metallic Linen.*—Enrolled January, 1828.

THE proposed mode of filling up the interstices of wire gauze, so as to render it impervious to air or liquids, is, by immersing the said gauze in melted metal, and causing that metal to adhere to the wire so as to close the aperture, and form a perfect plate.

In order to effect this object, it is to be observed that the gauze must be made of such metal or alloy as will not melt at so low temperature as the metal in which it is to be immersed; and in performing the operation, great care must be taken that the wire gauze is perfectly cleansed from all impurities, before it is introduced into the melted metal.

The usual fluxes must be made use of in order to cause the metals to adhere. For instance, sal ammoniac must be employed, where tin is the metal by which the interstices are to be closed. If copper, then borax; and for any of the other metals, the same fluxes as are commonly applied to the purpose of soldering or brazing.

The operation is this. Suppose the gauze be made of iron wire, take a piece of it, about one foot square, and having cleansed and trimmed it in the ordinary way, make a hot metal bath, of two parts tin and one part lead, and fix to the gauze two pieces of iron as frames or handles, at each extremity. The operator then takes hold of the gauze at each end by tongs, and while another person skims off the oxide from the surface of the metal, he plunges the gauze in the melted metal in a horizontal position, and then continues moving it gently backwards and forwards, for two or three minutes. He must then slide the ends of the gauze to and fro, out of the bath, in order that the metal might crystallize, and when the meshes or interstices of the gauze are all filled up, it may be withdrawn altogether, taking care that the motion is continued until the metal has set evenly.

The temperature to which the bath should be heated must depend upon the metal used. Its proper heat may be ascertained by occasionally dipping a piece of gauze into it, and observing when the crystallization appears sufficiently perfect to warrant the immersion of the article intended to be filled up by that metal.

Another mode of effecting the same object, is by means of moulds instead of immersion. Suppose it be requisite to fill up the interstices of a dish cover of a hemispherical shape, to be made of wire gauze. A mould is to be provided, of the exact shape of the dish cover; such a mould as is usually employed for pressing wire gauze into its form. The matrix of this mould is to be the bath containing the fused metal, the surface of which being skimmed over to remove the oxide, a sheet of the wire gauze, properly cleaned, is to be laid over the matrix, and the counterpart of the mould forced in, so as to press the wire gauze into the hemispherical form, the superfluous metal, of course, flowing over. In this situation it is to be kept until the metal is cold, and on being removed from the mould, it will be found that the interstices are closed, and that the cover is perfectly formed.

The patentee also contemplates filling the interstices with potter's earth. To effect this object, the earth or clay must be brought into a fluid state by mixing it with water, when the article being dipped into the liquid, it will adhere, and the interstices become closed. If one immersion is not sufficient, the same must be repeated until the interstices are perfectly closed; and when the clay has become dry, the article so treated may be baked in the usual manner.

Another mode of closing the gauze is by placing a thin sheet of soft metal upon the gauze, and pressing them together with great force, so that they may firmly adhere, and the effect produced after polishing the surfaces of the metal is very beautiful.

Paper or shavings may also be employed to fill up the interstices of the gauze by means of paste; or tortoise-shell or horn may be applied, it being first heated, to render it soft, and then pressed with very great force.

It is also proposed to fill the said interstices with glass; in doing which a sheet of wire gauze, prepared very smooth, is laid upon a plate or pane of glass, and these are put into a furnace together, and heated gradually, until the glass becomes soft; they are then laid upon a table or slab, and with a polishing tool the wire gauze is pressed into the glass. After which they may be annealed in a proper furnace in the ordinary way.

The patentee concludes by saying, "I do not restrict myself to the modes hereinbefore described, of filling up the interstices of the gauze, for I know that there are many other ways of effecting the same object; though I have found those methods hereinbefore described to be the best which I have tried. But I claim, as a new invention, the filling up of the interstices of wire gauze or wire net, with the various substances hereinbefore described, so as to form solid plates, sheets, or surfaces, for the purpose of various manufactures." [*Lond. Journ.*

To Robert Moore, *Distiller, in consequence of communications made to him by certain foreigners residing abroad, and discoveries by himself, for certain improvements in the process of preparing and cooling Worts or Wash, from Vegetable Substances, for the production of Spirits.*—Enrolled January, 1828.

This invention consists, first, in preparing worts from grain or other vegetable substances, washed in the state in which it comes from the mill stones, which washing is to be performed in a vessel, without a drain or bottom. Secondly, in cooling worts or wash, for the purpose of fermentation, by the addition of water, at a low temperature.

The grain or other vegetable matter, with all the husk, as it comes from the mill stones, is put into a vessel with a close bottom, where it undergoes the operation of washing. After having cooled it down, it is then fermented with the husky matter mixed up in it, and when the operation is complete, it is sent to the still.

The cooling of the wort or wash, is performed by the addition of water, at a low temperature, immediately before the yeast is introduced; the quantity of water required will be only so much as will reduce it to the proper temperature for fermentation, which is known by every practical brewer, and depends upon the density of the worts or wash.

By this method of operating, grain may be used in a state which will yield a better quality of spirit, than can be obtained by the ordinary means; there will also be a great acceleration of the process, and the cost of utensils employed in cooling will be saved.

The patentee says, "I do not claim the use of a vessel, without a drain or bottom generally; but I claim, as the said invention, first, the process hereinbefore described, of preparing the worts, viz. from grain or other the like vegetable substances put into a vessel, without a drain or bottom, with all the husky matter, just as it leaves the mill stones, and washed in that state in such vessel; and secondly, the process hereinbefore described of cooling worts or wash."

[*Ib.*

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*An Historical Account of Lithography; together with some important improvements recently made therein.**

The word *lithography* is composed, as every scholar knows, of two Greek words, the one signifying a *stone*, and the other *writing* or *drawing;* that is to say, the tracing upon stone any writing or design from which it is wished to obtain a great number of copies.

* Translated for Gill's Technological Repository, from Ferussac's *Bulletin des Sciences Technologiques*, in its notice of the unpublished work, *Mémoire sur quelques ameliorations apportées a l'art de la Lithographie.* By M. M. Chevalier and Langlume, of Paris.

This art, invented by a singer in the theatre at Munich, named *Senefelder*, was not, in its beginning, a very promising discovery: because it could only furnish products so coarse as not to compare with engravings upon copper; although it may now be said to rival, nay, we may add, even to surpass them in many cases.

It was about the commencement of the present century, that Senefelder began his first experiments, but he kept his processes secret; and imperfect as were the proofs multiplied at Munich, still the men of science and lovers of the arts judged therefrom, that in the hands of those who were able to improve the art, it promised the greatest advantages; and the government of Bavaria accordingly engaged to remunerate the inventor for any ideas he might be able to communicate thereon. Senefelder, thus supported by the government, founded an establishment in the year 1805, into which no stranger was allowed to enter, and which was directed by Senefelder himself.

In 1806, the French armies were in Germany; general Lomet, an indefatigable and learned man, and the best *technologer* which France possessed, arrived at Munich; he procured prints, stones, and lithographic crayons, and also obtained some information on the construction of the presses; and during the years 1806 and 1807, he executed some designs at Passy and Brannau, which he brought with him into France in the month of February, 1808. He was eager to communicate to every one the information he had thus collected respecting this novel art; he showed the prints and other proofs to all the world, but found every one so incredulous respecting it, that he could get no one to assist him in carrying it into effect.

M. Molard, senior, then Conservator of the Arts and Manufactures, was among the number of the incredulous.* The general placed in his hands, in order that it might form part of the collection, a lithographic stone of eight inches by ten, and bearing a drawing which he had executed upon it at Brannau, in the year 1807, and from which he had taken 500 impressions; thus confirming the success of the processes he had employed. M. Molard was then engaged with a new method of striking *en cliche*, for the improvement of vignettes for typographic printing; and he doubted at that time whether the art of lithography would ever be capable of any useful applications.

This disappointment obliged M. Lomet to withdraw his stone, and to seek for amateurs and artists who might be more favourably disposed to receive this happy invention, and which he wished in 1808 to see adopted and practised in France, as well as in every other enlightened nation in Europe.

M. Denon, director of the Museum of the Arts, was made acquainted with it; he was an excellent judge in this matter, but regretted that his occupations and his travels rendered it impossible for him to pay particular attention to it.

* This information is derived from an excellent Memoir, in manuscript, which M. Lomet presented me with about six months previous to his death, and which I shall shortly publish. A work so valuable ought not to be lost.

M. Landon was made acquainted with all that M. Lomet had brought with him from Germany, and greatly admired all the products of this novel art; he did not, however, think that he could apply the discovery to a work which he was then undertaking, a description of the Museum, but he considered that its merit entitled it to the most serious attention.

M. Gilet de Laumont, inspector-general of Mines, and who was a stranger to nothing which concerned the arts and sciences, saw at once the benefit which they might derive from lithography; and in proof thereof, expressed a desire that M. Lomet should form an establishment at Paris. Numerous individuals, no doubt, would also wish to be furnished with lithographic presses, as was his intention; but the functions with which he was charged, as a superior military officer, and the necessity he was under, of following the army to Spain, rendered it impossible for him to carry his intentions into effect. He, however, deposited the stone in the Museum of Natural History, of the *Jardin des Plantes*, where it figured amongst the calcareous stones.

It was not until six years afterwards, in 1814, that M. Engelmann, of Munich, established, in Paris, one of the largest lithographic establishments, bringing with him all the processes employed in the workshops of the cradle of this important art, which had remained nearly stationary until this period. The improvements which it has since received, are due to the increasing skill of our artists, who have both designed the subjects for it, and improved the processes. But it is within these three or four months only, that the lithographic art has received its chief and greatest improvements. We shall show the basis on which the lithographic art is founded:—

First, we make choice of a calcareous stone having a very fine grain, but susceptible of giving a firm adherence to the tracings made upon it with a fatty crayon, and with which the outlines of the prints we would produce are drawn; it must also be capable of becoming impregnated with water, which it must retain in its pores during a certain time.

Secondly, the stone must be such, that when it is wetted, it shall not contract any adhesion of the printing ink, excepting in those parts which are covered by the strokes or touches of the fatty crayon.

And thirdly, that when the stone is more or less covered with the design, traced by the fatty crayon, impregnated with water, and charged with the printing ink, on impressing it with a sufficient force, it shall be capable of transferring to a moistened paper, the greater part of the ink which covered the lines made by the crayon.

Lithographic stones have been, hitherto, brought from the neighbourhood of Munich, along the Danube, and near Pappenheim. They have been also found in France, but these do not possess all the qualities required by skilful lithographers; they do not afford surfaces of sufficient size, neither is their grain throughout of a homogeneous texture, fit for large subjects. The best stone has the following qualities:—first, its tint should be a whitish yellow, the yellow being uniform and without spots, threads, or veins, in it.

Secondly, its hardness should be sufficient, but without being too great, so that it may readily be scratched with a point of steel when necessary.

Thirdly, the splinters struck off it by a hammer, should have a conchoidal fracture; that is to say, the broken part should present a hollow on one side, and an elevation upon the other, like a shell.

Fourthly, its grain should be fine, and when wetted with a sponge filled with water, it should retain it for a sufficient length of time.

The advantages which the quarries in the neighbourhood of Munich possess, in affording a facility of procuring the stones, is great, as they are found in beds, and of an equal thickness, so that they do not require much labour in working them. They give them a regular shape by means of a saw.

The first work is to dress the stones, and give them a proper grain. The operation of dressing them is the same as that employed in grinding looking-glasses. The stone is laid upon a horizontal table, and rubbed all over its face in a circular manner, with another piece of stone, between which and the undermost stone there is interposed finely sifted sand and water. The grain becomes the finer, the longer it is rubbed, and the finer the sand is. The different kinds of work for which the stone is destined, require different dressings and grainings. We examine the grain from time to time, by raising the moveable stone, and blowing strongly upon the surface of the finer one, to drive away the excess of water, and then view its surface obliquely.

Upon the good quality of the *lithographic crayons*, likewise greatly depends the beauty of the work. They should adhere firmly to the stone in such a manner as not to be detached under any ordinary circumstances. They ought to be sufficiently hard for the designer to obtain a fine point, so as to draw delicate and well marked lines, without their breaking; if they are either too dry or too porous, they break in an instant: if they are too soft, they become crushed, and form coarse and confused strokes.

It appears that every artist adopts a particular receipt for his crayons; we shall confine ourselves to the describing that which MM. Bernard and Delarne employ with success.

Pure white wax (of the first quality)	4 parts.
Soap, dried, made of tallow and soda	2
White tallow*	2
Gum-lac	2
Lamp-black†	1
We also add of copal oil varnish	1

We first melt the wax over a slow fire, and then add by degrees, and a little at a time, the gum-lac, broken into small fragments, incessantly stirring all the while with a spatula; we then mix in the

* In winter, double this quantity should be used, in order to diminish the hardness of the crayon, caused by the lowering of the temperature.

† M. Lomet advises us not to use the black produced from smoke, but instead thereof, to substitute that produced from *charred rags*, which is much finer, and is known by the name of German black.

soap, previously reduced into fine shavings, and when the mixture is perfect, we pour in the oil varnish, with which we have previously ground up the black. We continue to heat and stir it continually, until the paste has acquired a convenient consistence, and which we ascertain by forming a crayon in a mould with it, and letting it becom ecold. We then try it with a penknife, and see whether the parings are brittle. When the paste is sufficiently heated, we form it into crayons, by pouring it into proper moulds.

We do not here intend to give a complete treatise on lithography, nor shall we enter into the necessary details on composing the *lithographic ink*, the *autographic ink*, or preparing the *autographic paper*, &c.;* but shall now proceed to make known the important improvements which have lately been made in this mode of printing.

Since the invention of lithography, the manipulations had not received much improvement until within little more than a month since, when the art received ameliorations of such importance, that we may almost affirm it has acquired a new existence! In order that we may be enabled to appreciate the immense advantages which M. Chevallier, a distinguished chemist, seconded by the talents and the zeal of M. Langlume, one of our best lithographers, have afforded to the processes necessary in the pursuit of this fine art; we must succinctly describe the means hitherto employed, in order to institute a comparison with those which will be used after the precious discoveries of these two benefactors to the art shall have become known. These improvements consist in three principal points, namely: first, in the *acidulation of the stones*, secondly, *in effacing work*, and thirdly, *in re-touching it.*

[TO BE CONTINUED.]

On Filing and Working Metals accurately flat.

[Extracted from Smith's Panorama of Science and Art.]

THE large vice must be firmly affixed to the side of the workbench, to the edge of which its chaps must be parallel, their upper surface being at the same time exactly horizontal. The best elevation for a vice, is that of the workman's elbow, when the upper arm is held vertically against the side; and the lower arm, for the sake of trying the height, is held at right angles thereto. In filing, if the vice or the work be above this position, which is seldom heeded, or even thought of, the stroke will not be so powerful as the same exertion would otherwise make it, and whether higher or lower, it will be found exceedingly difficult to carry the file in a horizontal direction. As the teeth on the inner surfaces of the vice-chaps would mark fine work, if pressed against it sufficiently hard to keep it

* These have been fully given in our recent numbers.

steady, they are, as often as occasion requires, covered with plates of lead, about the eighth of an inch thick. These plates must be large enough to extend about half an inch on each side beyond, and an inch above, the chaps, to each of which, when screwed tight, one of the plates is secured by hammering down the projecting parts.

The handles of hammers are almost always made of nearly a uniform thickness in every part. Hence, the vibrations of the hammers are communicated to the hand of the workman, to whom they convey very unpleasant sensations—he is tired before he has exerted his strength. If the handle of the hammer, at a little distance from its upper end, or that nearest to the hammer, be made considerably smaller, for a short space, than in any other part, so as to spring a little, the alteration will be found a decisive improvement. Such a hammer will fall well, and diminish at the same time the workman's fatigue, convincing him also, that his blows are solid and effectual. For chipping iron, the head of the hammer need not be more than a pound weight, and the handle about a foot long. In a hammer of any given shape, calculated to give the hardest blows with the least weight, and consequently with the least fatigue, the quantity of iron in the head should be equal on the opposite sides of a line, supposed to be drawn perpendicular to the centre of the face. Hammers, therefore, made for the purpose of drawing nails, with claws which lean backwards from this line, are not calculated to produce the best effect in striking. Clock-makers, tin-plate workers, and braziers, polish the faces of their planishing hammers; first, by rubbing them upon a soft wooden board, covered with a mixture of oil and finely washed emery, and they, as well as watch-makers and silversmiths, afterwards remove every scratch left by the emery, and give them an exquisite lustre with colcothar, or putty, applied with water in the same manner.

Metals are sometimes wrought by first chipping them. This operation not only produces the intended effect in an expeditious manner, but saves much expense in the files which would otherwise be required. It is most frequently applied to cast-iron, the outside of which, taken as it comes from the mould, is always harder than the rest, and frequently so very hard, that it would spoil the best file in a few minutes; while at no greater depth than the twentieth part of an inch below the surface, or even less, it is nearly as soft as brass. The chipping chisel will penetrate this hard crust, and afterwards, as may be easily understood, its edge need only be made to act upon the soft part. The flat edged chisel, for this description of work, need not be more than seven inches long, but it ought to be made of the best cast-steel; the hammer to be used with it, has been already mentioned. The chisel is held in an angle of about 45 degrees, and the blows of the hammer are given in quick succession. Some dexterity, certainly, and which can only be acquired by practice, is requisite to preserve a tolerably even surface, but the art is not of difficult acquirement. A pellicle of iron may, by the chisel, be taken from a surface of a hundred square inches in four or five hours, and when it has been well done, the file very speedily levels

the inequalities left by the chisel. When much exactness is required, it is adviseable to examine the work before the chipping is commenced, and if improper protuberances or hollows appear in it, the chisel must either be struck deeper, or not so deep, at such places, as the circumstance indicates.

In the working of metals, there is no operation more common than that of filing, and yet, perhaps, there is none so little understood. A file is an instrument too familiar to every one to need description. To use it well, however, generally proves one of the most difficult tasks which the practical mechanic has to encounter; and this difficulty is owing more to the want of a proper method in setting to work, than to any other cause. Plane surfaces, for instance, for the plates of air-pumps, and a thousand other purposes, are of indispensable use; but a knowledge of the manner in which they may be readily and completely executed, is confined to very few; and a workman aware of the exactness required from him, can rarely be found, who will undertake them. Grinding is the common and dernier resort of those who wish to produce, on such occasions, the last degree of accuracy; but two surfaces of metal may be ground together for ever, without being made plane, unless by some previous operation all their *cross-windings* are completely removed. In the execution, however, of this previous operation, nearly the whole difficulty of the task lies. In what must it consist? Grinding has a tendency to perpetuate any regular convexity or concavity, which either surface may have, and even to produce one or other of these surfaces on each piece, although both were plane to begin with. The application of turning to the production of plane surfaces, is not an easy undertaking, and requires an expensive apparatus; and often the mere fixing the metal to be turned upon the lathe-chuck, takes as much time as ought to be required for the completion of the work. We would incite, therefore, the ingenious artist to place confidence in the *file*, with which we hesitate not to assure him, that more beautiful and accurate workmanship may be executed, than most of those who are in other respects very respectable mechanics, are either apprized of, or disposed to consider possible. In this line of exertion, we have witnessed with admiration the performance of one who held a distinguished situation in the Royal Mint. With files alone, as his cutting and polishing tools, he not only produced specimens of workmanship which challenged all competition and the severest scrutiny, but effected his purpose with a degree of expedition and consequent economy, of which no other method would admit. The work (the appearance of which, though remarkably fine, was only a secondary consideration) required the exact parallelism of its several sides, some of which presented a surface of not less than fifty or sixty square inches; and in his hands the file did all this, in such a manner as to set at defiance the elegant art of turning, and to render the dirty and tedious process of grinding wholly unnecessary. How often, in provincial towns especially, have embryo inventions been kept back, for want of workmen of sufficient skill to execute the proposed contrivances, and how often would inventors them-

selves carry into effect their designs, if they were not filled with the apprehension that the acquirement of a competent share of manual dexterity, was too difficult a task to be attempted! Those who have had the most ample opportunities of observation, will not consider these as idle surmises; they cannot but be sensible that the inventions which become publicly known, are few, in comparison with those which spring up in the minds of ingenious men, and perish from such obstacles as have been just stated, often, perhaps, with the hour which gave them birth. What one man has accomplished, let not another despair of accomplishing also. The want of superior opportunities of experience, are often vanquished by superior exertions; and if these remarks on the excellence obtainable in an art of the first importance to the practical mechanic, should stimulate one person only to the improvement of his skill, they will not be useless.

The practical directions belonging to this subject, now claim our attention. Here the general principle, upon the proper application of which success depends, may, in the first place, be noticed; it is simply this: that if a plane surface, already known to be true, could be made use of so as to show with perfect facility and correctness the errors of another upon which the artist may be employed, as often as he wishes to ascertain the state of his work, a file, or any tool by which all the projections may be removed, without reducing the other parts, will enable him at length to bring the latter surface to an exact correspondence with the former. Such a perfect surface, either of stone or cast-iron, is, therefore, indispensably necessary in the art of flat filing; and we may add to it another implement of almost equal utility, though very little used, namely, a perfectly straight steel bar, which is called "*a straight edge.*" These obtained, then an assortment of files follows of course, as also a vice, or some other method of steadily supporting the metal upon which the file is intended to operate.

Files are differently formed, and of various sizes, for different purposes; their sections being either square, oblong, triangular, or segmental, and their denominations accordingly. That sort of file called the *safe-edge*, (on account of its not being cut into teeth on one of its edges,) and which is flat on both sides, and of an equal or nearly equal breadth in every part, is the best for every purpose to which its form admits of its being applied; and is particularly to be recommended in *flat filing*.

In choosing files, some degree of attention is requisite, and will save much subsequent trouble. A file, the surface of which is twisted in various directions, (a circumstance which very often happens in hardening it,) will constantly deceive the workman, as it will produce nothing but false strokes. The files must, therefore, be chosen free from such an imperfection; but a small degree of regular convexity is not detrimental. The goodness of a file, so far as its shape is concerned, may be readily determined by running the eye along it, in the same way as the joiner examines the straightness of a piece of wood.

It is, perhaps, too obvious to require remark, that the scratches made by a file will be proportionate to the size of its teeth; and that the larger or coarser these are, the greater will be the effect which an adequate force will produce at one stroke. Hence the very evident propriety of commencing the work with the coarsest file intended to be used, and afterwards, in regular gradation, employing finer and finer ones, as it approaches to the finished state. Files may be obtained, the teeth of which are so extremely fine, that they will leave the surface of metal, especially if it be brass, almost as smooth as an oil-stone. These are, however, seldom necessary; and for most purposes, files of three or four different degrees of fineness, are quite sufficient.

[TO BE CONTINUED.]

On improvements in Evaporating fluids, Generating steam, Economising fuel, and Lessening the friction in machinery. *By* JACOB PERKINS, *Esq., Engineer.*

Mr. Perkins's improvement in evaporating fluids, and generating steam.—Knowing the superior conducting power of metals, for heat, over that of water, Mr. Perkins made the following experiment. He caused two circular blocks of cast iron to be made, with flat bottoms, and a hemispherical cavity in each of them, of about three inches in diameter; one of these cups or cavities he left plain, but he filled the other with conical projecting points of cast-iron, formed at the time of moulding it. Upon heating both vessels to the same degree, and putting water into them; he found, as he expected, that the water in the vessel filled with the metal points, evaporated much faster than that in the other vessel. He next caused some iron cylindrical tubes to be cast, having radiating ribs proceeding from the interior surface of each cylinder all round to the centre of it, where they terminated in thin edges. Two of these he connected with his tubular high-pressure steam generators, and placed them in that part of his furnace where the heat was the greatest. Here, owing to the rapidity with which the caloric is given off to the water, through the superior conducting property of the metal, the tubes never become red-hot, and are, consequently, not so liable to injury from the heat of the furnace, as his other tubes were, whilst they generate steam more rapidly.

Mr. Perkins's mode of economising fuel.—He purchases the refuse, or smaller parts of gas-coke, which he sifts, so as to separate the minuter parts from those of a larger size; the latter he employs as fuel in the usual manner, but the dust he mixes with one thirtieth part of clay and water, and strongly compresses the mass in a cylindrical tube, out of which it falls in cylindrical pieces, more or less long. These he dries upon the top of his furnace, and they are then as capable of being burnt in it as the ordinary gas-coke. By

this means, he has actually been enabled to work his high pressure steam-engine, alone, or without doing any work for twelve hours, at the trifling expense of eleven-pence-half-penny! And, no doubt, the same economy will be experienced, in a proportionate degree, whatever work the engine may perform.

Mr. Perkins's mode of lessening friction in machinery.—He has succeeded in avoiding the necessity of employing oil, grease, or any other lubricator to the piston of the steam engine, in the following manner. His piston is formed of a bell-metal, composed of the following materials:—

Copper - - -	20 parts.
Tin - - -	5 do.
Zinc - - -	1 do.

This, as well as his cast-iron cylinder, is cast under the pressure of a considerable head of metal; by which means, the density and closeness of grain of each of them, is very greatly increased, and, indeed, the cast-iron has as close a grain as wrought iron itself! These two metals he finds to act so as to polish each other in use.

He also uses the same dense cast-iron to form his steam engine crank-axes, and the spindles or axes of his grind-stones, &c.; and he runs the cylindrical necks of them upon bearings formed of his bell metal, placed underneath them, and made with hollow cylindrical cavities, across their upper faces, not exceeding the sixth part of a circle in extent; and yet, upon these very small bearings, his necks run, with a very trifling portion indeed of grease, as a lubricator to them; whereas, as is well known, the bearings commonly in use, are semi-circular.

In this manner, the cylindrical necks of the axis of a large grind-stone, employed in grinding large articles, run; and yet, on throwing off the band from the rigger, or band wheel, the stone will make fifty revolutions, at the least, before it stops!

Mr. E. Turrell reminds us, that he was informed by Mr. P. Keir, that Mr. Kinman, formerly of Shoe-lane, London, used always to cast his brass ordnance, for the service of the East India Company, under a considerable head of metal: and this, together with the great care he took in watching the exact period when his metal in the furnace had attained its proper quality, as he ascertained by taking out specimens of it from time to time, caused his guns to possess a decided superiority over others, cast without using those necessary precautions. [*Tech. Rep.*

On Annealing Electrum and Tutenague.

These compound metals require a particular management in annealing them; they ought to be heated red-hot in a fire, made either of fir or deal, without knots; or in one made with the wood of the lime-tree; and be suffered to cool slowly, covered with the ashes.

The *electrum* is a new white metal; now getting into use, as a sub-

stitute for silver, in a variety of ways. The tutenague, or white copper, we have long been acquainted with; it ought to come from China, but we are in the habit of making a metallic alloy in this country in imitation of it; we believe that iron enters into the composition of electrum, and nickel into that of tutenague; but a good deal of obscurity prevails at present, in regard to the particular metals employed in the formation of these two compounds. The electrum is sold for about sixteen shillings a pound in London, and the tutenague for eight shillings.

The selection of fir or deal without knots, is a judicious one, as we well know the injurious effects of the turpentine, abounding in the knots of the pine or fir trees, in generating pyro-ligneous acid when burnt; and which, when in contact with heated metals, acts upon them very powerfully, as we have lately instanced in the case of cast-iron pipes, employed in conveying away pyro-ligneous acid, being converted into a substance resembling plumbago, or blacklead.

We know that an eminent awl-blade maker, of Warrington, in Lancashire, always annealed his steel in fire made of the wood of the ash-tree, and which he considered essential to its preservation.

[*Ib.*

[From the Revue Encyclopédique, of November, 1828, published in Paris.]

NOTICE

Of a defence of the experiments to determine the comparative value of the principal varieties of Fuel used in the United States, and also in Europe. Containing a correspondence with a committee of the American Academy of Arts and Sciences; their report and remarks thereon; and animadversions on the manner in which the trust confided to the Academy by Count Rumford has been managed. And, An answer to "A short reply to 'A defence of the experiments to determine the comparative value of the principal varieties of fuel, &c.' by one of the committee of the American Academy."—[*Published in Boston.*] *By* Marcus Bull, *Member of the American Philosophical Society, &c.*

We announced in our 22nd volume, page 38, the interesting memoir of Mr. Bull upon the different kinds of combustibles: a work for which the Rumford prize was claimed from the American Academy of Arts and Sciences at Boston.

The experiments of Mr. Bull were criticised with severity by the academical committee; it was decided that they had settled no one point, that the author of the memoir had assumed false premises, and arrived at false conclusions, and doctrines more dangerous than useful. This decision pronounced in America was equally opposed to the experiments of both worlds; for the philosophers of Europe en-

tirely concur with Mr. Bull. From the details given in the "Defence;" from the correspondence between the author of the memoir and the committee; from the form of the objections and remarks, it may be seen that the committee were more occupied with their own opinions on the subject, than in examining the work submitted to them. We do not doubt their impartiality; we rejoice to perceive that they have been always animated with the most praiseworthy zeal for science; for those who cultivate it, and for the arts which it enlightens and directs; but in the history of academical prizes, this decision, so contrary to the opinion of the scientific world, ought not to be omitted.

Mr. Bull has deserved well of the republic of letters, in bringing this discussion before the public: we may at a future day draw from it some useful warnings; and learned societies, if they continue to distribute prizes, will take care that their judgment shall not be condemned by the *irrefragable authority of the public.*

Franklin Institute.

The twenty-first quarterly meeting of the Institute was held at their Hall, on the 16th of April, 1829.

Mr. Abraham Miller was called to the chair.

The minutes of the last quarterly meeting were read and adopted.

The quarterly report of the board of managers was read and accepted.

In pursuance of the recommendation of the board of managers, it was

Resolved, That monthly meetings of the Institute be held for the purpose of discussing mechanical and scientific questions.

Resolved, That the meetings be held on the fourth Thursday evening in every month.

Extract from the minutes.

A. Miller, *Chairman.*

A. S. Roberts, *Recording Secretary.*

The Twenty-first Quarterly Report of the Managers of the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts.

In conformity with the laws of the institution, the board of managers of the Franklin Institute present a report of their proceedings during the last quarter.

Since their last report, the drawing school of the Institute has been closed for the season. The board have great satisfaction in stating that it has been conducted in an able and efficient manner, has been much more extensively patronized than in some former years, and productive of corresponding advantage.

The mathematical school has also been closed, and to this department, likewise, an increased attention has been directed by mechanics, and a high degree of interest excited, from which the board anticipate the most beneficial effects.

A semi-annual examination of the high school was held on the 12th, 13th and 14th of March last, under the superintendence of the committee of instruction. The order and attention of the pupils, their acquirements in the ancient and modern languages, in mathematics, in geography, and grammar, and in the subjects of their studies generally, were such as reflect great credit on themselves and on their instructers.

The regular courses of lectures have terminated for the season. They have been as well attended as in former years, and have contributed largely to increase the mass of scientific information already diffused through our community. Volunteer lectures have also been delivered nearly every Saturday evening during the past season, comprising a series of lectures on the important and interesting science of geology by Peter A. Browne, Esq., and a number of lectures on optics and miscellaneous subjects equally interesting, by Mr. Leib. The institution is greatly indebted to both these gentlemen.

The library has received several additions since the date of the last quarterly report, by purchase, donation and exchange, comprising some valuable works. The library is kept in the managers' room, which is warmed and lighted every evening, and is open to the members of the Institute. Several of the daily journals are also received.

In the same apartment commodious cases have been placed, for the reception of minerals, which, although not at present scientifically arranged, may be inspected with advantage. Many specimens are yet wanting, which, by a little attention to the subject on the part of the members of the Institute, might be readily supplied, without expense to the Institute, or to the individual members.

From the report of the committee on publications, it appears, that the Journal of the Franklin Institute has been so conducted, as not only to sustain its reputation, but to increase its usefulness, and, as the board believe, under happier auspices. Arrangements have been made for obtaining a *very considerable portion of original matter* for its pages. These arrangements embrace a circle of varied and useful talent, from the resources of which the board have great confidence that the subscribers will derive much valuable information.

In accordance with a resolution of the board, adopted at their meeting on the 12th of March, the following plan for holding monthly meetings of the members of the Institute is proposed for your consideration and encouragement. Much good is expected to result from the adoption of the measure. The personal acquaintance of the members with each other; the familiar interchange of ideas on philosophical and mechanical subjects, and such as pertain to the arts generally; the free discussion of unsettled points, and the concentration of the wandering and fugitive rays of knowledge on any and every subject embraced amongst the objects of our institution. Many

isolated facts are known to individuals, which are entirely useless to them, but which, when communicated, add to the stock of knowledge. No one, it is believed, can attend these meetings without deriving from them some advantage. The minds of few men, indeed, are so sterile as to be incapable of making any contribution to the treasury of useful ideas, and few will believe their intellectual wealth too great to be susceptible of increase.

The plan proposed by the committee appointed by the board for that purpose, provides for the fitting up of the lecture room; the arranging therein the architectural models; the erection of cases, and the placing in them of the apparatus belonging to the Institute; and the convenient fixing of tables.

The order of business at these meetings to be as follows:—

1st. The reading the minutes of the last meeting.

2nd. Donations to the cabinet of models, apparatus, and minerals, received.

3d. Donations to the library received.

4th. Reports of officers and committees.

5th. Unfinished business.

6th. Written communications received and discussed.

7th. Verbal communications received and discussed.

8th. Motions.

9th. Selection of questions for discussion at the next meeting.

At a meeting of the board of managers, on the 12th of March, it was unanimously *resolved* to adopt measures for instituting a series of experiments, to ascertain "the value of water as a moving power, and the relative effects produced by it on (water) wheels of different constructions." This object is one of the greatest importance which has come before the Institute.

It is true, that we are not entirely destitute of information on the subject. The talents and experience of many eminent men have been directed to this end, but the progress of desultory or accidental experience is tardy and uncertain; and the expense of direct and continued experiments, on a scale sufficiently large to produce the most certain results, is too great to come frequently within the range of individual enterprise; but even these have not been entirely wanting. Men whose names are neither unknown or unrenowned in the annals of science, have instituted experiments on the same subject; but however much they have illustrated it by their talents and sagacity, much remains to be effected. To do this, is the object of your board. They do not pretend to arrogate to themselves, either collectively or individually, abilities superior to those of the eminent men who have preceded them in the same path; but they wish to apply, and apply effectively, all they do possess, and hope to be aided by the experience of others conversant with such subjects. They desire, if possible, to establish, by patient, direct and careful experiments, conducted on a scale sufficiently large, the immutable principles which ought to govern our calculations on the point of inquiry; and, lastly, they wish that the honour of effecting it may belong to the Institute,

under whose auspices it originated, and the country of which they are proud to be citizens.

Your board are gratified to inform the Institute that the plan meets the approbation and encouragement of our city authorities, and that another public body has also evinced a disposition to aid and encourage them.

When the importance of the object to a very numerous class of our citizens, in the result of which they are directly or indirectly interested, is considered, the board feel assured that the means will not be withheld, and, as members of the Institute, you are respectfully requested to promote it by all the encouragement you may think it merits. All which is respectfully submitted.

A. Miller, *Chairman, pro tem.*

William Hamilton, *Actuary.*

LIST OF ENGLISH PATENTS

Which passed the great seal, from September 25, to December 18, 1828.

To Peter Rigby Wason, Esq. Barrister at law, for his having invented a certain improvement in the article commonly called stick sealing wax—September 25.

To James Neville, Engineer, for his having invented an improved machine or apparatus, for obtaining mechanical power from falls and running streams of water—September 25.

To Thomas Fowler, Stationer, for certain improvements in, or for raising and circulating hot water, hot oils, and other hot fluids for domestic and other purposes—October 2.

To John Brunton, Engineer, for improvements in the apparatus for manufacturing coal gas and coke, and also improvements in the method of arranging such apparatus—October 2.

To David Napier, Engineer, for certain improvements in machinery applicable to letter press printing—October 2.

To Thomas Tippett, Engineer, for certain improvements in the construction and mode of working engines with steam and air, and in the boiler or generator of steam, and in the application of such improved engines to a new method of propelling of vessels and other floating bodies—October 9.

To Samuel Lawson and Mark Walker, Machine makers and flax spinners, for having invented improvements in machinery for preparing and dressing hemp, flax, silk, and other fibrous substances—October 9.

To Henry Duxbury, Gentleman, for his having invented a new machine for splitting hides and skins—October 9.

To Edward Hancorne, Nail manufacturer, in consequence of a communication made to him by a foreigner, residing abroad, for an invention for certain improvements in making nails—October 16.

To William Godfrey Kneller, Chemist, for his invention of certain improvements in evaporating sugar, which improvements are also applicable to other purposes—November 27.

To Joseph D'Arcy, Esq. sole executor and residuary legatee of Charles Broadrip, Esq., deceased, for certain improvements in the construction of steam engines, and the apparatus connected therewith—November 29.

To Edward Dakin Philip, Chemist, for his having invented an improved distilling and rectifying apparatus—November 29.

To Robert Stein, Gentleman, for his having invented certain improvements in distillation—December 4.

To William Brunton, Civil engineer, for his invention of a machine, apparatus, or instrument, to ascertain and register the quantity of specific gravity, and temperature of certain fluids in transit; part or parts of which invention is or are applicable to other purposes—December 4.

To Philip Derbishire, Esq. for his invention of a certain medicine or embrocation, to prevent or alleviate sea sickness, which may be usefully applied to other maladies—December 4.

To Zachariah Riley, Engineer, for his having invented or discovered certain improved apparatus, to be attached to carriages, for the purpose of affording safety in travelling—December 4.

To George Rennoldson, Miller, for his having invented certain improvements in rotatory steam engines—December 4.

To John Hague, Engineer, for having invented certain improvements in the method of expelling the molasses or sirop from sugar—December 6.

To Isaac Dickson, Esq., in consequence of a communication made to him by a certain foreigner residing abroad, and discovered by himself, for an invention of an improved projectile—December 8.

To John Boase, Gentleman, and Thomas Smith, Mechanic, for their having invented certain improvements in machines or machinery for scraping, sweeping, cleaning, and watering streets, roads, and other ways, which machines or machinery may be applied to other purposes—December 10.

To Thomas Lawes, Lace manufacturer, for his invention of an improvement in the manufacture of bobbin-net lace—December 10.

To Charles Cummerow, Merchant, in consequence of a communication made to him by a certain foreigner, residing abroad, for certain improvements in propelling vessels—December 10.

To Abram Louis, Mechanic, for his having invented a mechanical volti subito, to assist the players of music quickly to turn the leaves of music books whilst playing—December 10.

To Samuel Jones, Artist, in consequence of a communication from a foreigner residing abroad, for a new and improved method of producing instantaneous light—December 10.

To Thomas William Channing Moore, Merchant, in consequence of his having received a communication from a foreigner, residing abroad, of an invention of an improved method or combination of machinery for manufacturing hats or caps—December 10.

To Valentine Llanos, Gentleman, in consequence of a communication made to him by a certain person residing abroad, of an invention of an improvement or improvements on bits—December 15.

To John Forbes, Architect or surveyor, for his new invented method of burning or consuming smoke—December 15.

To Richard Williams, Civil engineer, for his having invented certain improvements in the application of elastic and dense fluids to the propelling of machinery of various descriptions—December 15.

To Anton Bernhard, Engineer, for his having invented certain improvements on, or additions to, wheels or apparatus for propelling vessels, and other purposes—December 15.

To John Dicken Whitehead, Manufacturer, for his having invented certain improvements in making, constructing, or manufacturing cartridges, for sporting and other purposes—December 15.

To John Morfit, Bleacher, for his having invented a certain improvement in retorts used by bleachers, and makers of oxymuriatic acid, or oxymuriate of lime—December 15.

To John Slater, Manufacturer of coach springs and axletrees, for his having invented certain improvements in axletrees and the boxes for carriage wheels—December 15.

To John Levers, Machinist, for his having invented or found out certain improvements in machinery for making lace, commonly called bobbin-net—December 18.

To William Stead, Millwright and machine maker, and James Stead, wood valuer, for their having invented a paddle wheel upon a new and improved principle, for propelling steam packets and other vessels—December 18.

To Joseph Charlesworth and Joshua Charlesworth, Woollen manufacturers and merchants, and Samuel Andrew Mellor, cloth dresser, for their having invented certain improvements on, or additions to, gig mills, for the raising and finishing of woollen cloths and other fabrics —December 18.

To James Simister, for his new invented improvements in weaving, preparing, or manufacturing a cloth or fabric, and the application thereof to the making of stays and other articles of dress—December 18.

To Edward Josephs, Merchant, for his having invented certain improvements on the wheels, axletrees, and other parts of carts, wagons, and other conveyances—December 18.

To Francis Horatio Nelson Drake, Esq. in consequence of a communication made to him by a foreigner residing abroad, being in possession of the process for the invention of a peculiar till—December 18.

LIST OF FRENCH PATENTS

Granted in the first quarter of the year 1828.

(Concluded from page 223.)

Pierre Gervais Emmanuel Meunier, and Guillaume Mars, sheet iron manufacturers, for sheet iron measures, for measuring corn, &c. —5 years.

Raymond de Gaston, Ex-Receiver General, Paris, for a smoke machine, adapted at a small expense, to every chimney—5 years.

John Heathcoate, Paris, for improvements in the movement of the bobbins in making bobbin-net—15 years.

Dominique Marie Houlet, and Silvain Riverin, button makers, Paris, for the employment of pieces and remains of whalebone, for making buttons of all colours—5 years.

Maximin Cassagnica, Paris, for an apparatus for preparing and carbonizing peat—10 years.

Louis Baron, merchant, Nismes, for further improvements in distilling—10 years.

Schlumberger, father and son, Paris, for a loom for weaving flax and hemp—5 years.

Jean Louis Jaume, Paris, for a method of baking plaster and lime, and the soil for making tiles, bricks, and slabs—15 years.

Pierre Joseph Paret, mechanician, Montpellier, for a weighing machine—15 years.

Auguste de Boussard, watchmaker, Toulouse, for a superior self-cleansing level lamp—10 years.

Jean Baptiste Bailleul, chemist, Paris, for a distilling apparatus by steam, for extracting the alcohol from dregs of grapes, &c.—5 years.

Lagier, merchant, and Robiquet and Colin, chemists, Paris, for a method of purifying madder—10 years.

Ager & Co., Paris, for a machine for making matches—5 years.

Bandin, senior, Paris, for a new method of transporting and preserving fish—15 years.

Authoine, junior, Paris, for constructing furnaces of free stone, called *Pierre Brabantine*, or *Pierre à feu*—5 years.

Francois Jean Guillaume Dande, Paris, for metallic loop holes in stays, dresses, &c., instead of those worked with the needle—5 years.

Josue Heilman, Mulhausen, for a cotton spinning machine, called *lanterne bobineuse*—10 years.

Zuber & Co. painted paper manufacturers, Rixheim, for a method of printing paper by means of a hollow engraved roller, instead of by hand—10 years.

Francois Benoit Hermier, locksmith, Monteux, for an instrument for scythes to give them the curve—5 years.

Francois Vallett, cloth manufacturer, Lodeve, for a bandage with elastic cushion—5 years.

Sapy, brothers, Beaucourt, watchmakers, &c. for a mill for strengthening, cutting, and lengthening the wire intended for pins and for forming the worm of screws for wood or metal—15 years.

Pierre Bernadotte, and Daubauton & Co., Paris, for making paper of animal substances, called *aporeutype*—15 years.

Lichartier, drawing master, and Labove Delille, cultivator, for a machine for winnowing corn.

Matthieu Casson, billiard table maker, Paris, for a method of making the pockets of billiard tables with grooves, and other improvements—5 years.